FIGURE IV - 178. *Davao Gulf, NW shore.*
Mouth of Lasang River and adjacent mangrove swamps, looking north-northwestward. 1935.

FIGURE IV - 179. *Davao Gulf, N shore.*
Mouths of Tuganay and Tagum Rivers, looking north-northwestward. 1935.

Davao Light, there is a series of projections from the shore reef and several rocky detached shoals under ¼ to 4¾ fathoms of water. The outer edge of this group of reefs and shoals lies as much as ½ mile from the nearest point of the beach.

For dangers in Pakiputan Strait see R (4) above.

Except for the shoal 1 mile northward from Little Cruz Island, the head of Davao Gulf from the northern entrance of Pakiputan Strait to Bonbon Point may be safely navigated at a distance of 1 mile offshore. None of the few detached dangers along the coast of the mainland are over ⅓ mile from shore until Bonbon Point is reached.

About ½ mile northeastward from the broad, coral-fringed point 2 miles southwestward from the Tagum River, there is a circular shoal, about 300 yards in diameter and 700 yards from shore, which bares at extreme low water. This is practically the only danger in this vicinity.

Nearly ½ mile 170° true from the south end of Kopia Island, and ⅜ mile from shore, is a small round shoal covered by a least depth of 3¾ fathoms.

The bottom in the channel between Pandasan and Kopia Islands is foul and should not be attempted by a stranger.

A shoal under a depth of 5¼ fathoms lies ¾ mile 320° true from Pangasinan Point. Shoals of 8 to 10 fathoms extend about ½ mile off the point, and a 4½-fathom shoal spot lies ⅝ mile 193° true from the point.

About 4 miles southeastward from Pangasinan Point there are a number of reefs which bare at low water. Since these reefs lie inside the general line of headlands, they do not constitute dangers to navigation, if vessels keep at a distance of ½ mile from the coast.

FIGURE IV - 180. *Davao Gulf, N end.*
Coastline between mouths of Madaum and Hijo Rivers, at head of Davao Gulf, looking N. 1938.

FIGURE IV - 181. *Davao Gulf, NE shore.*
Pandasan and Kopia Islands, off wooded coastal lowland, looking SSW. 1935.

FIGURE IV - 182. *Davao Gulf, NE shore.*
Gill Point and Kopia Island, looking NNW. 1935.

FIGURE IV - 183. *Davao Gulf, NE shore.*
Coast near Magnaga Bay, looking NW. 1935.

FIGURE IV - 184. *Davao Gulf, NE shore.*
Coastal lowland near Matiao River, looking south-southeastward. 1935.

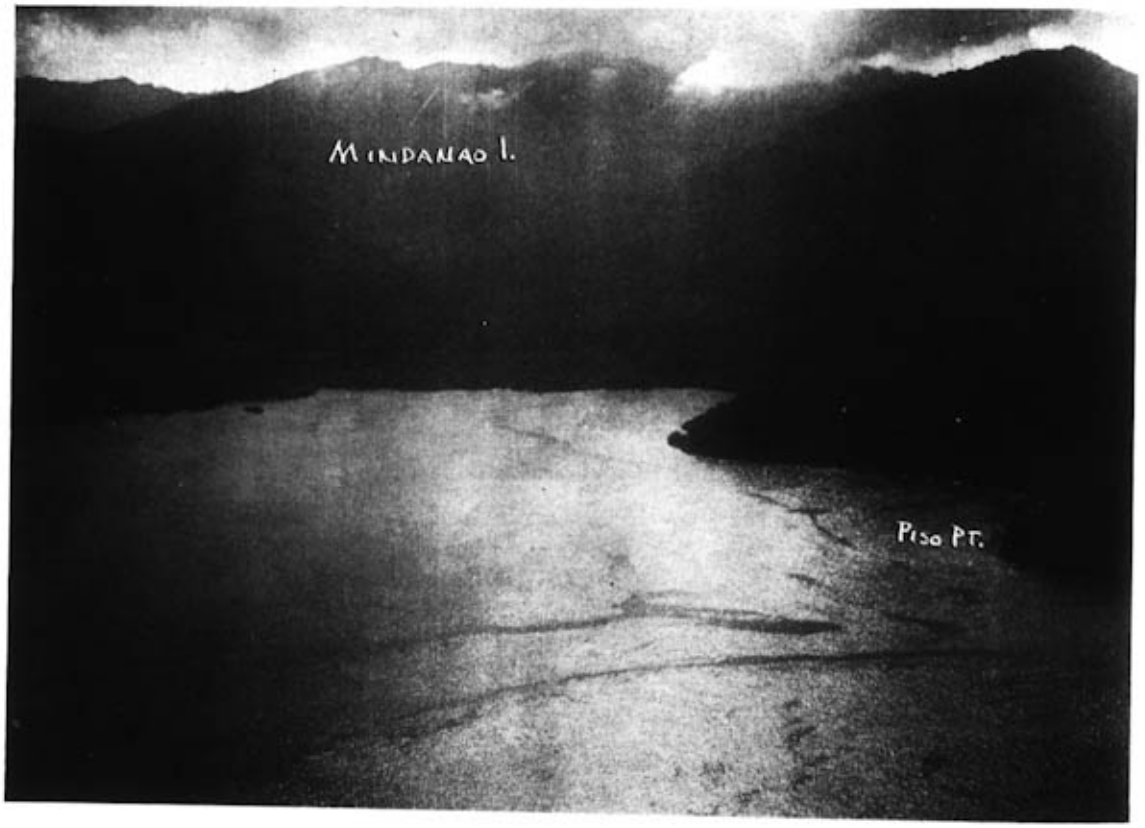


FIGURE IV - 185. *Davao Gulf, NE shore.*
Wooded slopes rising steeply from water's edge in vicinity of Piso Point, looking E. 1935.

Scattered shoals, with depths of 2 to 10 fathoms of water over them, extend from ½ to 3 miles northwestward from Piso Point. A 4-fathom shoal lies about ½ mile southwestward from the southwestern extremity of the point.

(5) Landing beaches.

(a) Davao beach. (PLAN 28, Section F(n); FIGURES IV - 186 to IV - 195) Reliability GOOD.

1. Location and extent. The shore in the vicinity of Davao, from Dumalag Point northeastward for a distance of 9 miles to Pakimikan, is lined by a nearly continuous sand beach, generally narrow, but attaining a width of almost 1,000 feet at low water in some places. The limits of the beach lie at 7° 02′ 30″ N, 125° 34′ 40″ E, and 7° 08′ 30″ N, 125° 39′ 40″ E. Dumalag Point is low and wooded but projects nearly 1 mile from the shore. The port of Santa Ana had a light. Along the northern part of the beach is Pakiputan Strait, a narrow channel between the mainland and Samal Island (FIGURE IV - 158).

2. Nearshore. The approach to this area is clear from the south between the mainland and the islands of Samal and Talikud. Several areas of coral reef occur in the channel when approaching the area from the north (PLAN 28). Nearshore about 1½ miles northeast of Santa Ana is an area of shoals, and the shore in that vicinity is lined with a fringing coral reef which extends northward to the limit of the beach. Coral also occurs at Dumalag Point. In the vicinity of the Davao River mouth are some shifting bars and shoals, but no fringing reef. Near Santa Ana, sand and mud flats extend from 300 to 1,000

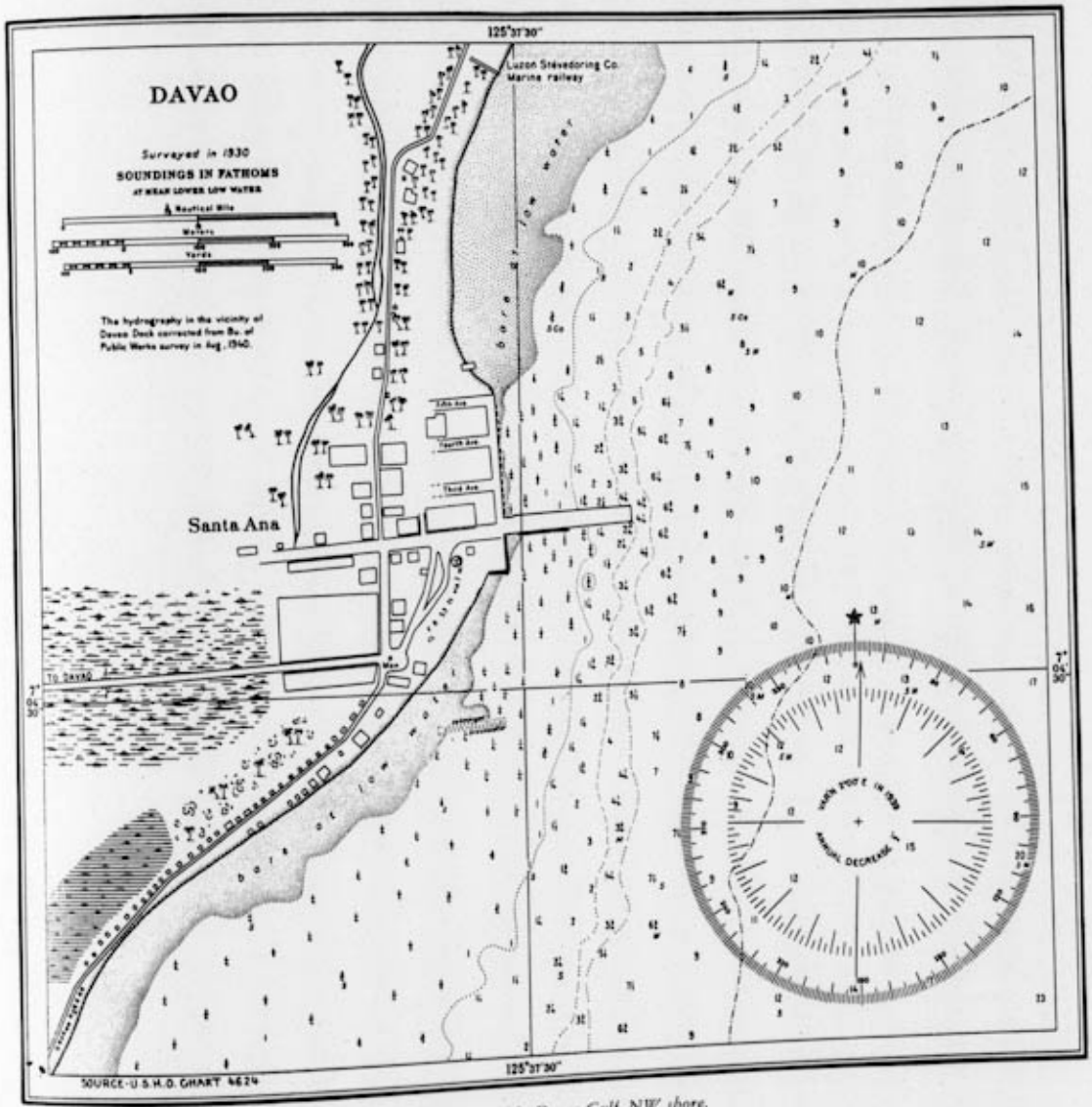


FIGURE IV - 186. *Davao Gulf, NW shore.* Chart of Santa Ana, port of Davao.

feet from the shore and bare at low water (FIGURE IV - 186). A submerged breakwater lies about 300 feet from shore, about 900 feet south of the Santa Ana pier. Bottom materials are sand and mud, partly of coral origin, with some rocky patches near the northern end. The southern part of the beach is exposed to winds and swell from the southwest through southeast, but the northern section of the beach is protected to some extent by Samal Island. The mean tidal range at Davao is 4.3 feet, and the usual tidal current flows northward on flood. However, in Pakiputan Strait, along the northern section of the beach, tidal currents sometimes set to the south on both flood and ebb. This condition occurs during strong northerly winds, or after a strong southwest wind has backed up the water into the northern end of Davao Gulf. Currents in the strait attain at times a velocity of 2½ knots.

3. Character of beach. The beach is narrow but fairly continuous from the base of Dumalag Point to the mouth of the Davao River. Here the beach is interrupted and a delta-like extension has grown outward on both sides of the river mouth (FIGURE IV - 171). Northward of the river mouth the beach widens to the vicinity of the Santa Ana wharf. (FIGURES IV - 187 to IV - 190). The beach continues for about 3,300 feet northward of the wharf to the mouth of a small creek (FIGURE IV - 191). Northeastward of the creek the beach fronts an abandoned river channel, shown in this figure. In the vicinity of Lanang Point, the beach is about 25 feet wide (FIGURE IV - 192). Northward of Lanang Point the beach continues generally very narrow to Pakimikan (FIGURE IV - 176). Along this part of the coast the fringing coral reef is continuous. The beach is composed of sand, with occasional scattered pebbles or pieces of coral debris. For the most part the sand is of coral origin, but in the vicinity of the Davao River mouth it is mainly of non-coral material. The slope of the beach is fairly steep, and near Santa Ana it is about 1 on 5 (FIGURE IV - 188). The beach is firm, but at the mouths of the Davao River and other streams it may be soft locally.

A number of structures occur along the beach (FIGURES IV - 171 and IV - 193). There are 2 fish traps between the Davao River and Santa Ana, several small piers, a stone breakwater, the main wharf, a small harbor at Santa Ana, and at least 2 short piers at Lanang Point. The buildings of Santa Ana lie, in part, directly along the beach (FIGURE IV - 187). Surf along the beach is least intense in the vicinity of Lanang Point, and increases in intensity in both directions, but notably to the southwest when waves are running from the south. Shore drift is locally variable, but the predominant direction of movement is northeastward along the shore.

4. Adjacent terrain and exits. Behind this beach is a low flat coastal plain. Between Dumalag Point and the mouth of the Davao River the beach is backed by coconut groves and wooded areas leading inland to grassy or cultivated plains. The town of Davao lies along the Davao River, centering about 1 mile inland

FIGURE IV - 187. *Davao Gulf, NW shore.*
Santa Ana, looking northward. September 1935.

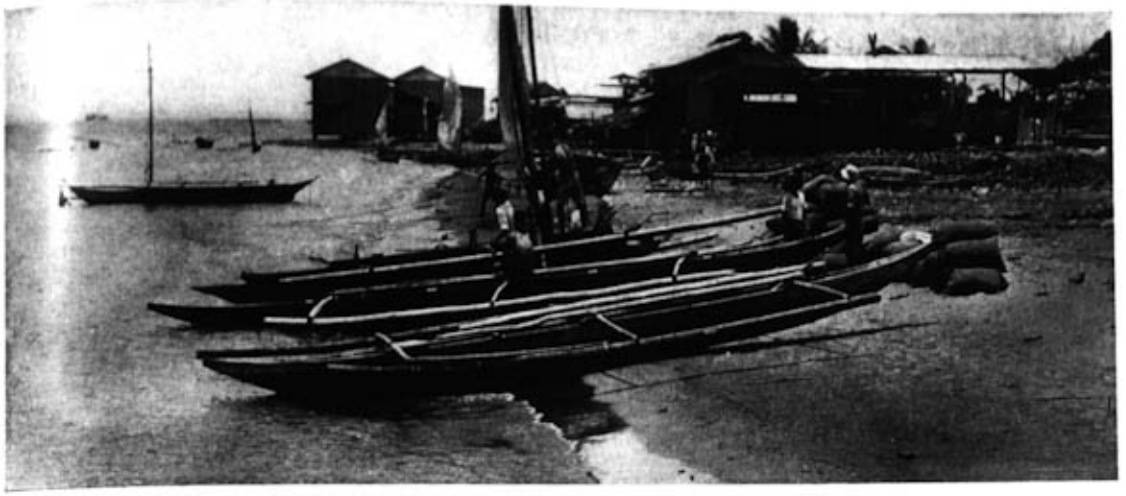


FIGURE IV - 188. *Davao Gulf, NW shore.*
Beach at Santa Ana, a short distance south of wharf, looking southwestward. 1944.

FIGURE IV - 189. *Davao Gulf, NW shore.*
Beach at Santa Ana, looking eastward toward Samal Island.

FIGURE IV - 190. *Davao Gulf, NW shore.*
Typical beach N of pier at Santa Ana, looking eastward to Samal Island. Pohun Point in left background. 1929.

(FIGURE IV - 172). Between Davao and Santa Ana are numerous tidal channels of the Davao River, marshy at high tide. A road, in part on a causeway, runs northward out of Davao and eastward to Santa Ana. Another road runs east from Davao to join a shore road behind Santa Ana. The area between the 2 towns is partly cultivated in coconut groves. Northward from Santa Ana the beach is separated from the mainland by the tidal stream or creek which enters the gulf about 3,300 feet north of the wharf. A road runs along the beach from Santa Ana to the creek mouth. North of the creek mouth, the beach is immediately backed by coconut palms and an old river channel, with additional palms and cultivated areas farther inland (FIGURES IV - 191, IV - 194, and IV - 195). From the vicinity of Lanang Point northward the area immediately behind the beach and inland is covered with coconut groves. The main coastal highway approaches Davao from the southwest, crossing the river on a bridge which may be seen in the lower left of Figure IV - 172. The highway approaches the shore north of Davao, and from Lanang Point northward it is easily accessible from the beach. Most parts of the beach have good exits except close to the Davao River mouth, and in places north of Santa Ana where it is necessary to move

FIGURE IV - 191. *Davao Gulf, NW shore.*
Beach backed by old channel, between Santa Ana and Ipil. Mouth of creek in lower left is 3,300 feet northward of Santa Ana. Edge of landing field at extreme right.

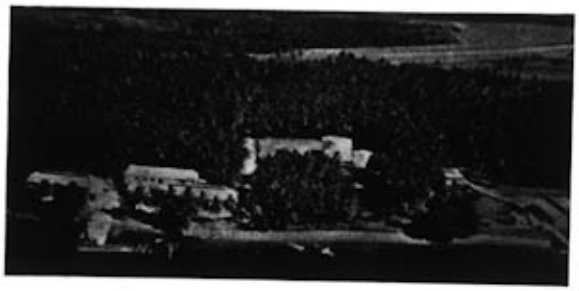


FIGURE IV - 192. *Davao Gulf, NW shore.*
Tanks and wharves of Asiatic Petroleum Company at Lanang Point, looking westward. Landing field in upper right. After 1938.

laterally along the beach because of the tidal streams. Two airports are located in the area, one a short distance north of Davao (FIGURE IV - 172) and the other at Lanang Point (FIGURE IV - 173). Fresh water is available in Davao and water for boilers may be had at the Santa Ana wharf.

(*b*) *Lasang River beach.* (PLAN 28, Section F(o)) Reliability FAIR. A narrow sand beach about 2 miles long extends northeastward from the mouth of the Lasang River in a small bight between 2 low points. The limits of the beach area lie at 7° 15′ 10″ N, 125° 40′ 40″ E, and 7° 17′ 40″ N, 125° 41′ 40″ E. There are no conspicuous landmarks in this vicinity.

The approach to the beach is clear; within the 30-foot depth the bottom slopes are gradual and lead locally to tidal flats which extend for varying distances seaward of the beach. The bottom material is mainly coral sand and mud. The beach is exposed to the southeast but is partly protected from the northeast by a low point fronted by a fringing coral reef. The mean tidal range is about 4.5 feet, and the flood tidal current moves northeastward along the shore, although local wind conditions as influenced by the strait between Samal Island and the mainland may cause reversals of the current.

The beach is composed of coral sand; it is firm and has a slope of about 1 on 6. Both northward and southward the beach grades into muddy portions lined with mangrove. At least 1 small stream interrupts the beach near its northern end. No structures occur on the beach. Surf may be moderately heavy when waves approach from the southeast, and shore drift is predominantly northeastward.

Immediately behind the beach is a low bank near the high water line, but the general terrain inland of the beach is flat. A trail runs parallel to the beach from the village of Lasang and the main provincial highway runs southward from this settlement toward Davao and beyond. Coconut palms fringe much of the shore behind the beach, but areas of mangrove occur at both ends.

(*c*) *Mansaca Point beach.* (PLAN 28, Section F(p); FIGURES IV - 196 to IV - 199) Reliability FAIR. A discontinuous narrow sand strand extends about 2 miles southwest of Mansaca Point and an equal distance northeast. The limits of the beach lie at 7° 20′ N, 125° 45′ E, and 7° 22′ N, 125° 49′ E. There are no conspicuous landmarks in this vicinity.

The approach to the beach is clear to the 30-foot depth; the bottom slopes within that depth are gentle, and shoal areas extend outward from the river mouths in the vicinity. The bottom material is mainly mud. No fringing coral reef occurs along this coast. The beach is exposed to the south. The mean tidal range is about 4 feet, and the flood tidal current moves northeastward along the shore. The beach is generally very narrow at high tide, but sand flats several hundred yards wide bare at low tide. The beach is interrupted not only by the mouths of 4 rivers, but by patches of mangrove (FIGURES IV - 196 and IV - 197). The best parts of the beach are along the shore between Mansaca Point and the mouth of the Hijo River (FIGURE IV - 198).

The beach is composed of sand which becomes muddy in the vicinity of the river mouths. The beach is soft near the rivers, but otherwise it is firm. The beach slopes are moderate to steep, averaging about 1 on 10. There are no structures along the beach. The surf breaks in a wide belt when waves are running, and shore drift is predominantly northeastward along the shore.

The land behind the beach is a low coastal plain with a dense natural vegetation along most of the shore, but with developed and cultivated areas inland in the vicinity of Madaum and Hijo, where hemp is extensively grown (FIGURE IV - 199). A trail parallels the shore at a distance of about 1 mile from the beach, and from Madaum a poor road leads westward, ultimately joining with the main provincial highway leading southwestward.

(*d*) *Mampising beach.* (PLAN 28, Section F(q); FIGURES IV - 200 to IV - 203) Reliability GOOD. From a point on the mainland opposite the center of Kopia Island southward to 1 mile beyond Gill Point, the shore is bordered by a narrow, locally rocky, beach with a total length of about 2½ miles. Its limits lie at 7° 16′ 40″ N, 125° 50′ 20″ E, and 7° 14′ 30″ N, 125° 50′ 30″ E. A landmark for the area is Kopia Island, low and wooded (FIGURE IV - 200).

The approach to the landing area is obstructed by this island and by Pandasan Island to the northeast (FIGURE IV - 200). The channel between the islands and the mainland has numerous shoals, and close to shore the bottom slope varies from gentle to steep (FIGURE IV - 201). Narrow fringing coral reefs occur locally along the shore and nearly surround the 2 islands. The bottom materials are coral sand and mud with some rocky patches. The beach is exposed to the west, although the northern part of it is sheltered by Kopia Island. The mean tidal range is about 4 feet and the flood tidal current moves northward along the shore.

The beach is composed mainly of coral sand, and in the vicin-

FIGURE IV - 195. *Davao Gulf, NW shore.*
Pier at Ipil, about 1½ miles NE of Santa Ana, looking NNW. Landing field to left of Ipil. 1935.

FIGURE IV - 194. *Davao Gulf, NW shore.*
Landing field and coral-sand beach near Ipil, looking northward.

ity of Gill Point, coral debris is mixed with the sand. The beach is narrow and steep-to, but at Mampising the slope is about 1 on 20. The beach is firm and, in places, vehicles may be driven along it. At Mampising is a wooden pier, 100 feet by 10 feet (FIGURES IV - 202 and IV - 203).

The terrain inland of the beach is a plain rising gradually to the interior hills. The beach is lined with coconut palms mainly, and a trail parallels the shore connecting the village of Mampising with villages to the north and south.

Kopia Island has small beaches on its eastern and western shores.

(e) *Pangasinan Point beach.* (PLAN 28, F(r); FIGURES IV - 204 and IV - 205) Reliability GOOD.

1. Location and extent. For a distance of about 6 miles northward of Pangasinan Point and 4 miles southeastward, is a sand beach, interrupted in part, but lining nearly all the shore. The beach width varies from about 25 feet to a maximum width of several hundred feet at low water. The limits of the beach lie at 7° 12′ 20″ N, 125° 52′ 20″ E, and 7° 05′ 20″ N, 125° 55′ 40″ E. The most conspicuous landmark is Piso Point, several miles southeast of the beach area. This point stands out boldly, with a hill rising to 775 feet.

2. Nearshore. The approach to the beach area is clear except for several shoals which occur within a radius of 1 mile of Pangasinan Point, and several other scattered shoals near the southern limit of the beach area. Nearshore the bottom slopes range from gentle to moderate, with some shoal areas close to shore, and with a fringing coral reef near the mouth of the Magnaga River (FIGURE IV - 204). Bottom materials are mainly mud, largely of coral composition. The beach is exposed to the southwest and west. The mean range of the tide is about 4 feet and the flood tidal current moves generally northward along the coast. Tide rips are encountered among the shoals near the southern part of the beach.

3. Character of beach. The part of the beach north of Magnaga Bay is generally somewhat narrow, but along the shore of Magnaga Bay a broad band of sand bares at low water (FIGURE IV - 205). It is at least 500 feet wide just south of the Magnaga River mouth, but narrows to the mouth of the Kingking River. South of the Kingking River the beach continues fairly broad, and at Pangasinan Point the beach coarsens to gravel. Southeastward of this point past Bonbon Point, the beach continues of good quality. Several rivers interrupt the beach, some of them, such as the Magnaga River, flowing parallel to the shore for a short distance from their mouths (FIGURE IV - 205). The beach is fine sand, locally coral; along much of its extent it is composed of materials brought down by the rivers. Near some of the river mouths the beach becomes muddy and locally soft, although in general it is firm. The beach slopes vary from gentle in the widest portions to about 1 on 10 in some of the narrower parts. No structures occur along this beach. The surf breaks in a belt of varying width, widest where the nearshore bottom slope is gentlest. Shore drift is prevailingly northward.

4. Adjacent terrain and exits. The terrain behind the beach is a coastal plain which narrows southward, vanishing beyond the southern limit of the area. A trail parallels the shore within 1 mile along the entire beach area, passing through several coastal villages. Coconut groves line much of the shore and extend inland among cultivated hemp fields. Some stands of wood are also scattered over the plain. Near the mouth of the Kingking River is a broad delta locally enclosing a salt water

FIGURE IV - 195. *Davao Gulf, NW shore.*
Vertical view of landing field, beach, and old stream channel near Ipil. Buildings and pier of Ipil in upper left corner. Top of picture is eastward. January 1935.

pond, which may be faintly seen in the middle distance of FIGURE IV - 205.

T. Davao Gulf Area: Piso Point to Cape San Agustin.

(PLANS 28 and 30; U.S.C. and G.S. charts 4608, 4624, 4625, and 4656)

(1) Offshore zone.

The distance of the 10-fathom line from shore varies from about 300 feet to ¾ mile. Maximum depths within a zone 5 miles from the coast increase southward from about 440 fathoms west of Piso Point to over 1,200 fathoms southwestward of Kagarchan Point.

A bank about 7 miles long north—south and 1 mile wide, with depths of 92 to 100 fathoms, lies about 16½ miles southeastward of Cape San Agustin.

The near-shore bottom sediments consist of sand, coralline limestone, and coral debris, locally interrupted by mud flats off the river mouths. This zone attains a maximum width of 2¾ miles southward from Sumlug Point, but is ordinarily much narrower. It grades seaward into deeper water muds with abundant coral patches and some small sandy areas.

Off Cape San Agustin there appears to be a strong, constant, southwesterly current.

(2) Coastal topography.

South of Piso Point the high interior mountains extending from the head of the gulf are interrupted by a trough-like depression which extends eastward from Davao Gulf to the Pacific Ocean. Although this depression is occupied by numerous heavily timbered hills 500 to 2,000 feet high, the terrain is low in comparison with the 4,000- to 6,000-foot ranges to the north and south.

South of the trough the mountains extend southward in a large peninsula to Cape San Agustin, reaching their greatest elevation of 6,000 feet or more about 23 miles north of the end of the cape. The rivers emptying along the coast between Piso Point and Cape San Agustin are small, and the few native villages are unimportant. There are a number of sawmills and scattered hemp and coconut plantations along the shores of the peninsula. Most of the coconut groves parallel or lie near the beaches.

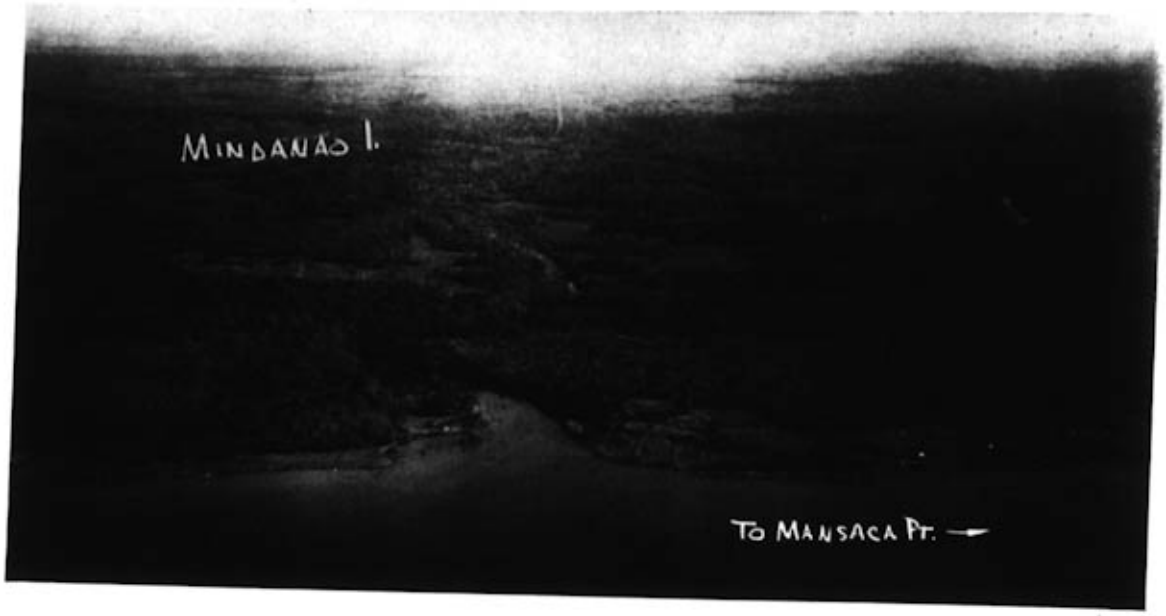


FIGURE IV - 196. *Davao Gulf, N shore.*
Coast just W of Mansaca Point, looking NNW. Lowland forested, with some cultivated clearings. 1935.

FIGURE IV - 197. *Davao Gulf, N shore.*
Mansaca Point and Libuganon River, eastward of FIGURE IV - 196, looking northward. Beaches interrupted at many points by mangrove swamps and river mouths. 1935.

FIGURE IV - 198. *Davao Gulf, N shore.*
Madaum River and vicinity, eastward of FIGURE IV - 197, looking northward. 1935.

FIGURE IV - 199. *Davao Gulf, N shore.*
Mouth of Hijo River at head of Davao Gulf, looking NW. Beaches along coast at left. Forested lowland, interrupted by hemp fields, extends back from coast. 1935.

FIGURE IV - 200. *Davao Gulf, NE shore.*
Kopia and Pandasan Islands and adjacent coast, north of Mampising, looking southwestward. 1935.

Between Piso Point and Arena Point, about 7½ miles southward, the coast curves eastward, forming Mapanga Bay (FIGURES IV - 206 to IV - 210). (U.S.C. and G.S. chart 4656) The larger part of the shore of the bay is lined with mangroves. Precipitous heavily timbered mountains rise from the water's edge along the north shore of the bay (FIGURE IV - 209), but the south shore consists of a densely wooded coastal flat (FIGURE IV - 210). This coastal plain is backed by rolling foothills covered with timber and patches of cogon grass, and extends southward to the vicinity of Bato Point. Heavily wooded mountains rise behind the foothill belt.

The mouth of the Piso River, about 4 miles southeastward from Piso Point, is not prominent but can be recognized by a small nearby reef which bares at low water. The mouth is nearly closed by a bar, and can be entered only by pulling boats. The river banks are lined by mangroves for at least ¾ mile inland. A short sandy beach borders the shore south of the river mouth.

A small area of coconut groves and hemp lies between the Piso and Mapanga Rivers and extends about 1½ miles inland.

The Mapanga River, which enters the sea about ½ mile southward from the Piso River, is a salt mangrove-bordered slough with a fine sand bottom. It can be entered by a ship's launch at high water.

The Kabatan River, which discharges about 1½ miles northward of Arena Point, is similar to the Mapanga River, but is smaller and only 2 to 3 feet deep. Its inconspicuous mouth is heavily fringed by mangroves.

Arena Point is low, flat, and heavily wooded. Although it is actually very short and smoothly rounded, from both north and south it appears as a sharp point extending far out from the general coastline. It is clear and steep-to, with a depth of 10 fathoms at a distance of only 250 yards from its western extremity. A beach of fine sand borders the coast from Arena Point to Sumlug Point.

Mount Galintan, situated about 6 miles east-northeastward from Arena Point, is a symmetrical volcanic cone rising to a height of 1,710 feet. A somewhat smaller cone 1,630 feet high lies immediately southward of the summit. The peak forms a prominent landmark and is almost always free from clouds. Still higher, rolling, mountainous terrain rises behind Mount Galintan.

From Arena Point the coast trends southeastward 4½ miles to Sumlug Point. Between these points shoal water extends in some places to a distance of ⅜ mile offshore. The Lupon River, an unimportant slough, follows the beach for about 1 mile in a northerly direction, and enters the sea about 1¼ miles southward of Arena Point. The town of Lupon is a port of occasional call for large inter-island vessels.

Sumlug Point is prominent partly because of a dry sand bar off the mouth of the Sumlug River, which discharges through the point. A number of native houses standing on the beach, facilitate recognition of the point.

From Sumlug Point the coast trends eastward, then southward, to Bato Point, forming Cuabo Bay, which is about 4 miles wide at its entrance and is indented about 1½ miles. The small village of Cuabo is situated at the mouth of the Cuabo River (FIGURES IV - 211 and IV - 212), about 2½ miles eastward from Sumlug Point. The town is marked by a few coconut trees and is fronted by a sandy beach. Both the Cuabo and Tibauan Rivers are lined with mangrove swamps for about 1¾ miles above the village.

Bato Point is the abrupt end of a ridge about 400 feet high and 1½ miles long in a northeast-southwest direction. Steep cliffs form the western and eastern flanks of the ridge, which

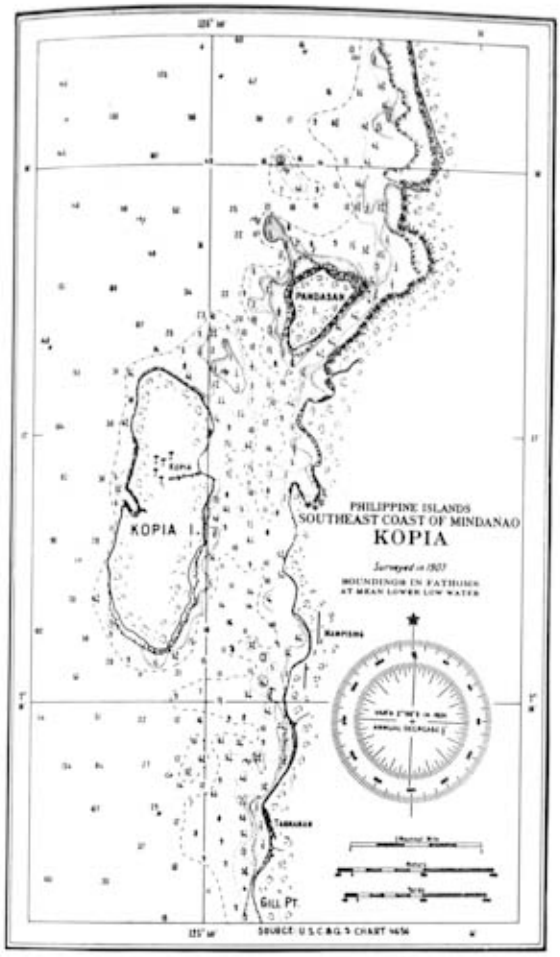


FIGURE IV - 201. *Davao Gulf, NE shore.*
Chart of Kopia and Pandasan Islands and vicinity.

terminates in a high bluff. A sandy beach extends about 1 mile northward from the point.

From Bato Point, the coast trends southward for about 3 miles to Bitaogan Point, with a flat embayment between the points. For 1 mile southward from Bato Point the shore is fringed with coral extending seaward to a distance of about ⅓ mile; thence the reef tapers toward the coast disappearing about ⅜ mile northward of Bitaogan Point. A coral sand beach, commencing about 1 mile south of Bato Point, continues to Bitaogan Point. For about 2 miles northward from Bitaogan Point low, heavily wooded hills come down close to the beach, forming a small bluff at 1 locality. South of the point the hills retreat a short distance inland.

The end of Bitaogan Point is low, and usually shows a bar of shingle nearly covered at high water, at the mouth of the Bitaogan River, which discharges through the point. Less than ½ mile behind the point the land attains an elevation of 400 feet. The Bitaogan River carries a depth of 3 to 4 feet for only about ¼ mile, then changes to a shallow mountain stream running over boulders and containing good fresh water.

From Bitaogan Point the coast trends southward and eastward for about 1½ miles to the northern entrance point of

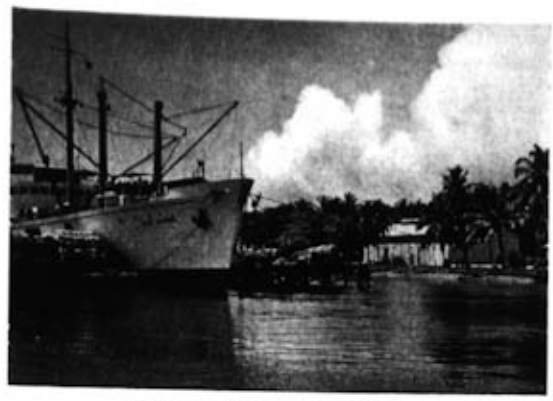


FIGURE IV - 202. *Davao Gulf, NE shore.*
Pier and beach at village of Mampising, looking northeastward.
19 October 1939.

Talisay Bay. This stretch of coast is bordered by mangroves, behind which is a sandy beach and a few coconut groves. Midway between the 2 points is a narrow strip of cogon grass, which extends directly inland for nearly 3 miles and is notable for its smooth, level appearance. The country on either side of the grass strip is heavily wooded and very rough.

Talisay Bay is about 1½ miles wide at the entrance and is indented about ½ mile. The shores of the bay are fringed with coral to a distance of about ¼ mile. The low coastal flat surrounding the bay is swampy and thickly covered with jungle growth. On the north shore, about ⅓ mile back from the beach, there is a very prominent hill rising to a height of 393 feet. A conspicuous patch of cogon grass extends almost from the water's edge to the summit of this hill. A short sandy beach borders the northeast side of the bay.

Duas Point, at the southern entrance to Talisay Bay, is flanked by bare cliffs, 50 to 100 feet high. The ridge forming Duas Point rises to a hill 800 feet high, about ½ mile southeastward from the point and about ¼ mile from the coast. Over ½ mile southward from the 800-foot hill, across a deep valley, is a second and more prominent hill 910 feet high, which has very precipitous slopes and terminates in steep bluffs along the shore. Both hills are heavily wooded.

From Duas Point the coast trends southward for about 2 miles to the northern entrance point of Baksal Cove. Although the shore line for the first ¾ mile is rocky, the remainder is bordered by a sandy beach. From Duas Point to the mouth of Uangon Creek, 1½ miles southward, there is very little reef fringing the shore. Coral begins southward of the creek, attains a width of about 350 yards at the entrance to Baksal Cove, and then narrows toward the head of the cove, where it disappears. Part of the reef between Uangon Creek and Baksal Cove bares at low water. Commencing about ½ mile southward from the creek and extending for ⅜ mile southeastward from the mouth of the Mabua River, mangroves grow near the outer edge of the reef.

The village of La Union, or Uangon, lies on the beach near the mouth of the Uangon Creek, which flows over a small coastal flat. Several iron-roofed houses show well to seaward. La Union is the largest settlement on this section of the coast. Coconut groves line the shore between the town and the swamps surrounding the mouth of the Mabua River.

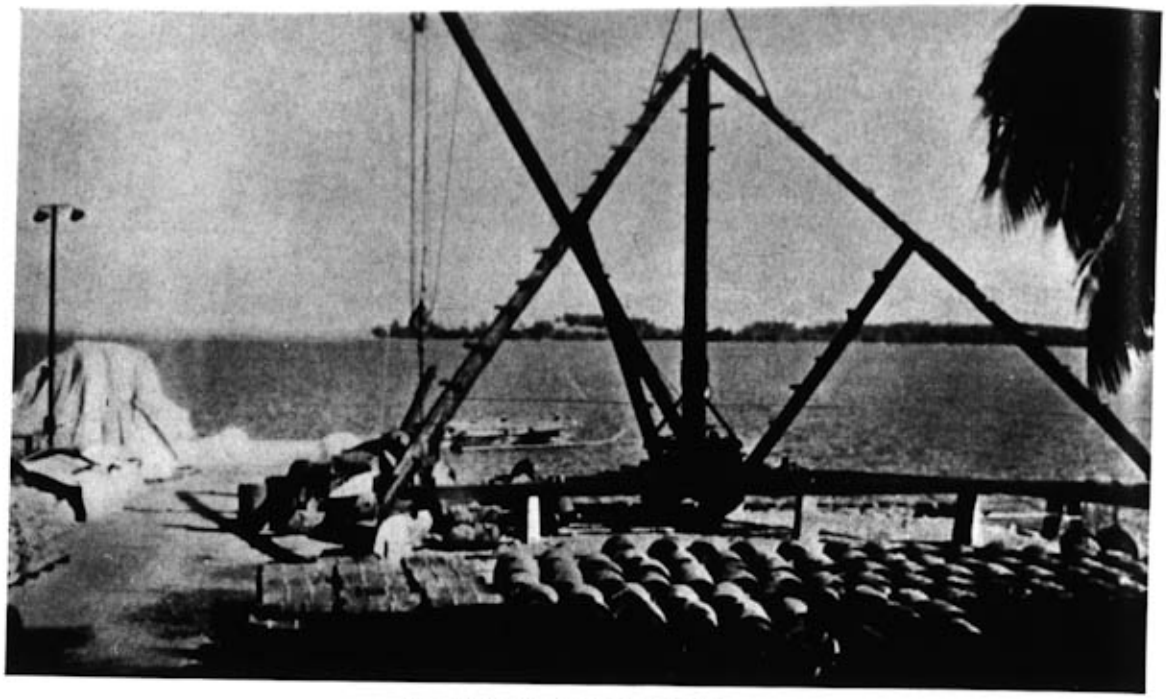


FIGURE IV - 203. *Davao Gulf, NE shore.*
Pier at Mampising, looking westward. Kopia Island in background. Before 1941.

Baksal Cove is a semicircular indentation about ½ mile wide at the entrance and ½ mile long. A sandy beach beginning at the head of the cove continues southward to Borot Cove. The northeastern and part of the southeastern shores of Baksal Cove are fringed with coral. The narrow, wooded coastal plain surrounding the cove is broken by a short spur from the foothills, which extends to the head of the cove.

Widening to over 2 miles behind Bais Point, the plain runs southward to the high east-west ridge on the north side of Borot Cove. A 315-foot hill, mantled with cogon grass, rises above the forest-covered flat about ¾ mile east of Sigaboy, and another hill, timbered and 510 feet high, lies about the same distance northeastward from Mangkanay Point.

Bais Point is a low, rounded bulge in the coastline commencing just southwestward from Limut Point, at the southern entrance to Baksal Cove, and extending southward 1¼ miles. The white sand beach bordering the point is conspicuous from seaward. The beach on either side of the Timbo River, which discharges through the northern end of the point, is higher than elsewhere, rendering the mouth of the river fairly prominent. The point is covered by timber which gives way to cogon grass in places. There are several cattle ranches in this vicinity.

Sigaboy, situated on the southwestern extremity of Bais Point, has many iron-roofed houses and a large church, which show conspicuously through the coconut trees. It is the second most important village on the eastern shore of the gulf.

From Bais Point the coast trends in a general 165° true direction for about 3½ miles to Borot Cove. There is a narrow fringing coral reef and a beach of white sand that shows well to seaward.

Sigaboy Island, located nearly 1½ miles southward of the town of Sigaboy and about ⅜ mile from shore, is about ¼ mile long east—west and less than ⅛ mile wide. It is encircled by steep rocky cliffs and surmounted by 2 grass-covered hills. The eastern and higher knoll rises to a height of 250 feet. There is a blunt pinnacle, about 150 feet high, at the west end of the island. A sandy point extends 60 to 100 yards from the east end. The navigable channel between it and the mainland has a width of about 200 yards and a depth of 6½ fathoms in the middle. Sigaboy Island shows up well only from northward and southward. From other directions it is projected against a background of wooded hills and mountains and is visible only in a favorable light.

Between Sigaboy Island and Cape San Agustin there are no known dangers more than 1 mile from shore, and the coast can be navigated safely at a distance of 1½ to 2 miles.

Borot Cove is about ⅜ mile wide at the entrance between Borot and Salun Points and is indented nearly ½ mile. It is readily identified, as the approaches on either side are steep, rocky bluffs. On Borot Point a white slide shows prominently to the southward. The white sand beach northward of the point is conspicuous from seaward. The entrance points and the head of the cove are fringed with reefs.

Monserat, consisting of a large hacienda and some 15 houses scattered among the coconut trees, lies at the head of the cove. The buildings roofed with galvanized iron show prominently to seaward. It is reported that little sea enters the cove, although it is open to the west-southwest.

From Borot Cove the coast trends southward for 3½ miles to Padada Point; thence southward and eastward for 4½ miles to Batikual Point, the northern entrance point to Nangan Bay. There is a small beach at the head of the bight between Salun

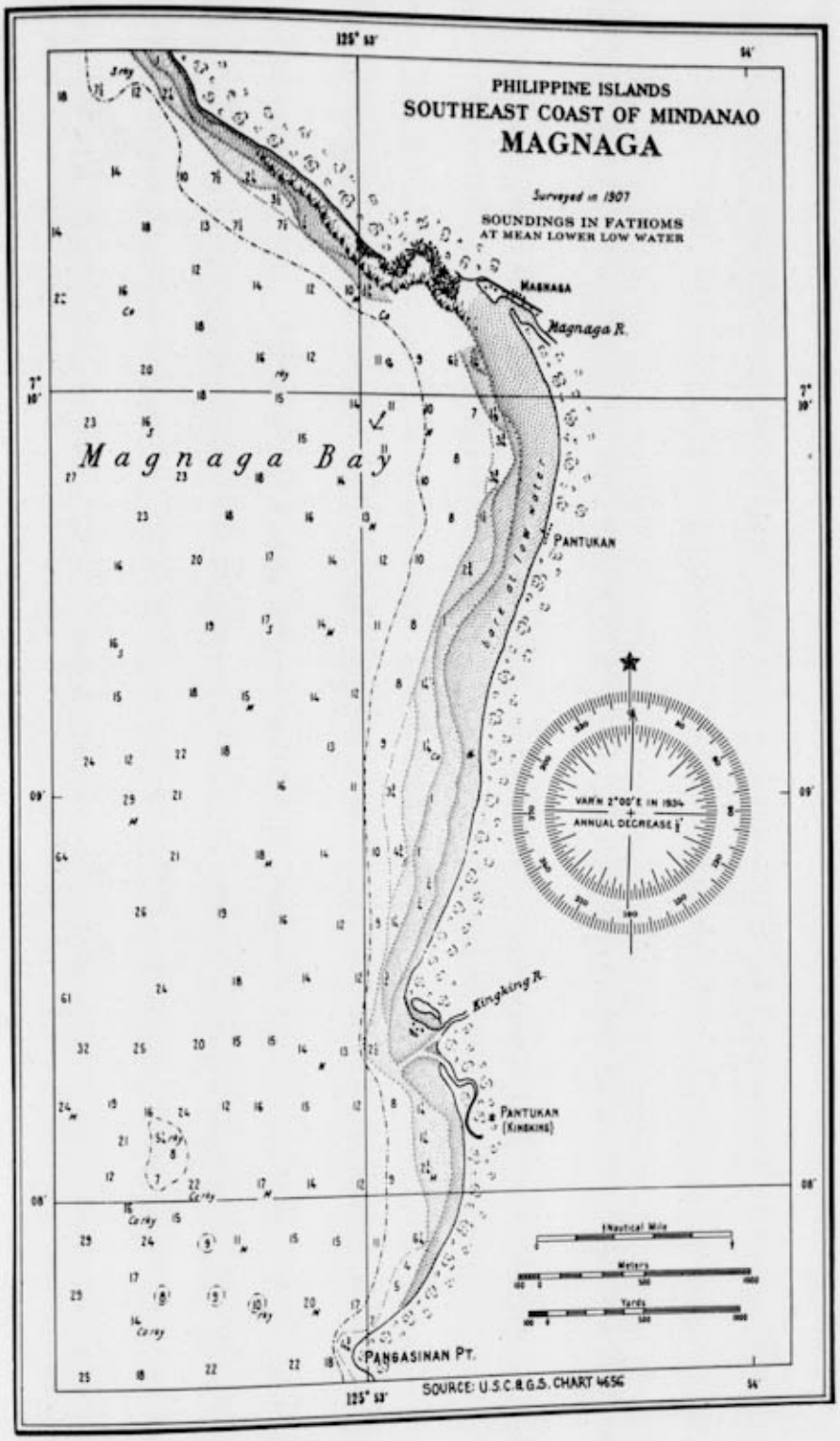


FIGURE IV - 204. *Davao Gulf, NE shore.*
Chart of Magnaga Bay and vicinity.

FIGURE IV - 205. *Davao Gulf, NE shore.*
Magnaga Bay and beach, looking south-southeastward across mouth of Magnaga River. Pangasinan Point in distance at right. Cultivated coastal lowland. 1935.

and Lilisan Points. This section of the coast is lined by long sandy beaches and fringed in some places by a narrow reef.

The bluff at Lilisan Point, about 1 mile southward from Borot Cove, is steep and about 100 feet high. It stands out prominently from seaward.

The southern part of Tambalan Point, ½ mile farther south, also terminates in a steep bluff. Both Lilisan and Tambalan Points are the ends of spurs extending seaward from Mount Bilbogan.

Mount Bilbogan, a pyramidal extinct volcano rising to a height of 2,450 feet, lies 1 mile east-southeastward from Lilisan Point. Towering above the surrounding foothills and isolated from the high peaks inland, it forms a very conspicuous landmark for the whole eastern part of Davao Gulf. The remarkably symmetrical outlines of the mountain can be recognized for miles, especially from the north or south. Seen from either of these directions, its summit appears as a serrated ridge consisting of 3 small peaks. Seen from the west at a few miles offshore it appears as a sharp peak with a steep secondary cone protruding from its slopes a short distance below the summit. Mount Bilbogan is rarely obscured by clouds, even when the inland peaks are heavily blanketed.

From Tambalan Point a wooded coastal plain ½ mile to 2 miles wide stretches southward to the head of Abag Bay. Its level surface is broken by a low, isolated, grass-covered hill, 320 feet high, lying 1¼ miles southeastward from Padada Point, and by numerous prong-like timbered ridges projecting outward from the foothills.

Padada Point is low, flat and rounding, but from both north and south it appears as a distinct point. The village of Magdug lies on the beach about 1 mile northward of the point and the village of Luzon about 1½ miles southward of the point. A mangrove slough runs southward from Magdug across the coastal flat behind Padada Point to Luzon, and a small mangrove patch lies along the coast south of Luzon Creek.

The village of Tiblawan (Ascension) is situated at the mouth of Tiblawan Creek, about 1 mile northwestward of Batikual Point. A large house, roofed with galvanized iron and set in an extensive coconut grove, shows prominently to seaward.

Batikual Point is low, wooded, and fringed by a reef which bares for ¼ mile.

Nangan Bay, immediately southward of Batikual Point, is ¾ mile wide at the entrance between Batikual and Kagan Points and is indented about ⅓ mile. Its shores are low and wooded and in the northern part of the bay are fringed with reefs.

From Kagan Point the coast trends in a general 162° true direction for 4 miles to Kaganuhan Point, with a deep intervening curve forming Abag and Tagabibi Bays. The entire curve is bordered by a sandy beach. A narrow fringing reef lines the northeast side of Abag Bay. The coast line is regular and even and can be safely approached to within ¼ mile. There are several large coconut groves along the shores of Abag Bay. The small and unimportant villages of Nazaret and Kalaguhan are situated on the coast ½ and 3 miles, respectively, southeastward from Kagan Point. Two iron-roofed houses lying close together on the beach at Nazaret are prominent landmarks from offshore.

Kaganuhan Point is conspicuous from both north and south chiefly because of 6 hills that rise in an ascending series from

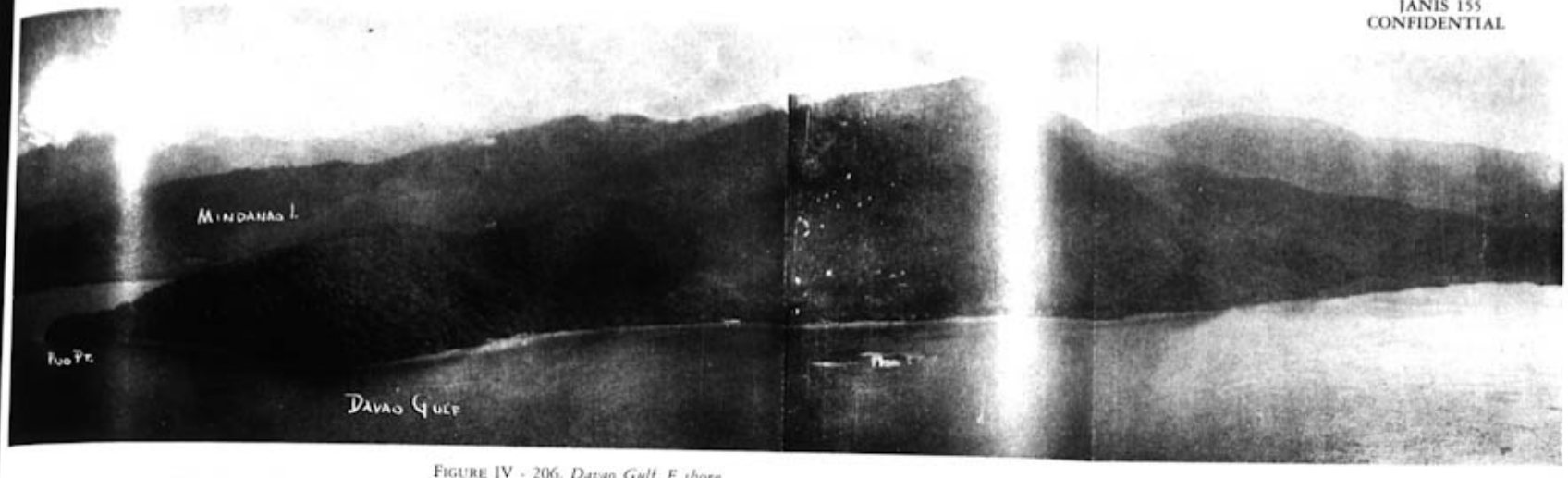


FIGURE IV - 206. *Davao Gulf, E shore.*
Piso Point and vicinity, with forested mountains rising steeply from the shoreline, looking northeastward. 1935.

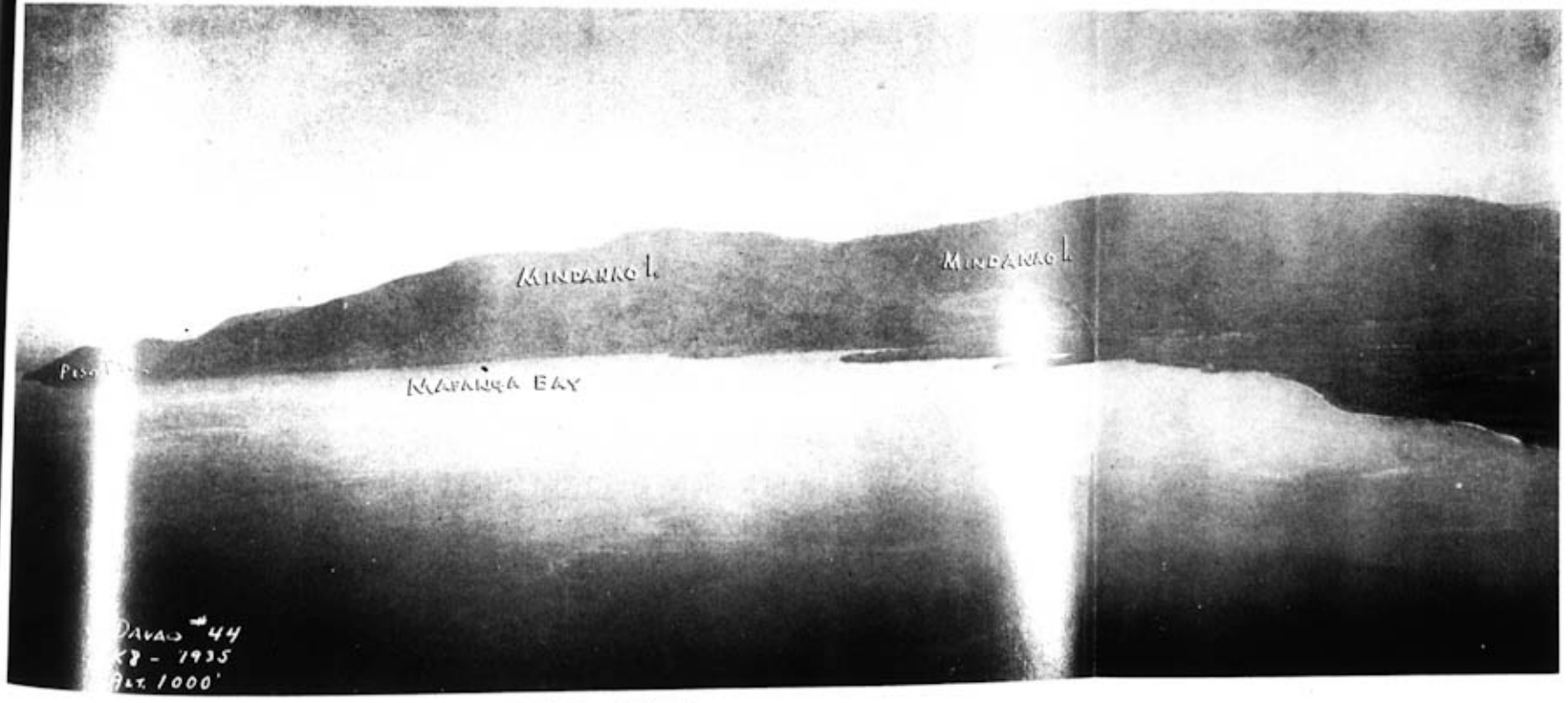


FIGURE IV - 207. *Davao Gulf, E shore.*
Piso Point and Mapanga Bay, looking northeastward. Southward of the mountains of Piso Point, a coastal lowland reappears. 1935.

the point, although viewed from the southward only 4 hills are visible. There is a large coconut grove on this point. The end of the promontory is low, flat, and fringed by a reef and foul ground to a distance of about 600 yards. It should be given a berth of at least ½ mile in passing.

From Kaganuhan Point the coast trends in a general 155° true direction for 8 miles to Cape San Agustin, with a slight concave curve intervening. Along this stretch of coast wooded foothills come down to the shore, forming a somewhat indented coast. Most of the coastline consists of very rugged, uplifted coralline limestone, which is most difficult to traverse. The points terminate in bluffs, commonly composed of limestone. Mangroves line the shore between Kanikian and Lima Points. The very few sandy beaches are short and narrow. In some places the shore is fringed by coral reefs which extend as much as ¼ mile.

Tagbanao Cove is a secluded bight situated about 2 miles southeastward of Kaganuhan Point. A sandy beach occurs at the head of the cove. Tagbanao Point on the south side of the entrance is rather high and shuts out the view to the southward.

Pundaguitan Anchorage, lying on the south side of Lakga Point about ½ mile southward of Tagbanao Cove, may be recognized by the cogon grass which mantles the steep north wall of a small valley behind the anchorage. There are 2 or 3 native houses in this valley. A fine sand beach along the cove shows up prominently from offshore.

Kanikian Point, about 2 miles southward of Lakga Point, is low and wooded, and terminates in a cliff about 15 feet high. It is fringed by a coral reef to a distance of about 300 yards.

Between Kanikian and Lima Points there is an abrupt rectangular indentation in the coast line about 1½ miles long. The shore of this bight is low, straight, and fringed with mangroves. A coral reef extends offshore to a distance of about ¼ mile. Lavigan Anchorage (U.S.C. and G.S. chart 4656), at the south end of the bight, is merely a small break in this reef.

Lima Point and Talisay Point are both fairly conspicuous; the latter lies about midway between Lima Point and Cape San Agustin. A good but narrow sand beach is reported to exist along this coast near the cape.

Cape San Agustin lies at the southern extremity of the long, narrow, mountainous peninsula which bounds the eastern side of Davao Gulf. The northern portion of the peninsula is cut by deep valleys, but the southern part, 5 miles long, is a continuous ridge of hills. The elevation of this ridge gradually decreases southward from a hill 1,120 feet high at its northern end to the rocky bluff 15 to 20 feet high at the end of the cape.

Cape San Agustin itself is a narrow, relatively low, flat-topped, wooded promontory, about ¼ mile long north—south. Its western and southern edges terminate in steep cliffs. A bluff is also reported to extend along the east side of the promontory, but is not shown on U.S.C. and G.S. chart No. 4625.

The Pacific side of the cape for about 2 miles northward consists of a succession of sandy beaches separated by rocky bluffs. The bluffs are fringed by strips of sand or gravel and can be skirted on foot at any stage of the tide.

Cape San Agustin Light, 06° 16′ 18″ N, 126° 11′ 30″ E, was exhibited 132 feet above high water from a white steel-framed structure erected on a bluff near the southern extremity of the cape. Vessels rounding the cape should keep at least 1½ miles off this light to clear San Agustin Reef.

A rock 18 feet high, very prominent when seen from east or west, lies about 20 yards southward from the cape. It is fringed by a reef connecting it with the mainland.

(3) Anchorages.

Vessels can find anchorage nearly anywhere along this coast in fine weather, but nowhere can shelter be obtained from southwest winds.

For anchorage off Monserat, see Chapter VI.

Nangan Bay provides anchorage in 22 to 28 fathoms, muddy bottom, about 300 to 400 yards from shore, protected from all winds except those from the south and west.

Restricted anchorage may be found in the middle of Tagbanao Cove in 18 to 20 fathoms, muddy bottom.

Pundaguitan Anchorage lies on the south side of Lakga Point about ½ mile southward from Tagbanao Cove.

Lavigan Anchorage (U.S.C. and G.S. chart 5646), lying on the north side of Lima Point, nearly 2 miles northward from Cape San Agustin, is merely a break in the fringing reef. It is too small to afford anchorage for anything larger than a small launch.

FIGURE IV - 208. *Davao Gulf, E shore.*
Mapanga Bay, looking NE. 1935.

FIGURE IV - 209. *Davao Gulf, E shore.*
Piso Point, looking northward. 1935.

(4) Dangers to navigation.

There are a number of reefs in Mapanga Bay of which 3 are awash at half tide; the others are covered with depths of ¼ to 5 fathoms.

Mapanga Reef, lying about 2 miles 160° true from Piso Point, is bare at low water. Within the 5-fathom curve, this reef is about 1 mile long. Approximately 1 mile southwestward from the portion of Mapanga Reef that bares is a small spot covered by 2¾ fathoms.

Piso Reef is a small reef which bares at low water, lying about 1½ miles south of Mapanga Reef, and about the same distance westward from the northern entrance point of the Piso River.

Between the Mapanga and Piso Reefs and the shore are a number of small, dangerous reefs, whose positions will be understood best by referring to U.S.C. and G.S. chart 4656. Composed of coral and white sand, they show up well when the light is favorable. A bearing on Piso Point 2° true will clear the western side of all dangers in this vicinity.

About 1½ miles 255° true from Sumlug Point there is a small detached reef covered by a least depth of ½ fathom. From here to the parallel of Sigaboy Island, about 13 miles southward, there is a chain of dangerous detached reefs; some of these bare at low tide, and others are covered with very little water. The 2 outlying reefs, Talisay and Burias, are described below. The position of the others will be understood best by referring to U.S.C. and G.S. charts 4608 and 4624. In the area between these reefs and the mainland are a number of small, dangerous, detached shoal patches, and the waters of this vicinity must be navigated with caution.

There are a number of small detached shoals, covered by very little water, in the center of Cuabo Bay.

Talisay Reef, partly bare at low water, lies about 3 miles west-southwestward from Bitaogan Point. It is nearly 1 mile long north-south, ⅛ mile wide, and is surrounded by deep water.

About ½ mile south-southeastward from Talisay Reef is a cluster of rocks, bare at high water, surrounded by a small reef.

Burias Reef is 2 miles southward of Talisay Reef and nearly 4 miles 255° true from Duas Point. Near its northern part is a shifting heap of white coral sand, about 2 feet high, and 4 to 20 yards in diameter. The remainder of the reef is nearly bare at low water and shows a number of scattered coral heads. Within the 10-fathom curve this reef is about ½ mile long in a northeast-southwest direction and ⅛ mile wide. It is surrounded by deep water.

The remainder of the reefs in this vicinity are covered by ¼ fathom or more. Since they are composed of white sand and coral they are easily seen when the light is favorable.

There are a number of detached shoals lying ½ to ¾ mile from this section of the coast.

At the head of Baksal Cove there is a small rock awash less than ¼ mile from shore. In the middle of the cove there are several detached reefs covered by depths of ½ to 2 fathoms. A chain of small detached reefs extends for a distance of about 1 mile in a north-south direction off the entrance to the cove.

Between Bais Point and Borot Cove the coast is faced by a chain of detached reefs lying ¼ to ½ mile offshore.

Between Sigaboy Island and Cape San Agustin there are no known dangers more than 1 mile from shore, and this section of the coast can be safely navigated at a distance of 1½ to 2 miles.

Borot Reef, the center of which lies about ½ mile westward from Borot Point, is circular, about ¼ mile in diameter, and covered with very little water. Near its southern edge there are rocks awash.

From Lilisan Point to Nangan Bay the coast is faced by a number of small detached reefs, none of which are more than 1 mile from shore.

About ¼ mile south-southwestward from Cape San Agustin is the northern edge of San Agustin Reef, a large, dangerous reef nearly ¾ mile long in a south-southwesterly direction, and more than ¾ mile wide. This reef, which is covered by depths of 1½ to 5 fathoms, breaks heavily at times.

There is a good channel for small boats between San Agustin Reef and the cape. This channel may be found by steering on a 115° true or 295° course to give the 18-foot rock off the pitch of the cape a berth of about 300 yards. This channel is only a little more than 200 yards wide, and should be used with caution because of the strong and irregular currents which are experienced in this vicinity. Vessels rounding Cape San Agustin should keep at least 1½ miles off the light to clear San Agustin Reef.

FIGURE IV - 210. *Davao Gulf, E shore.*
Mapanga Bay, looking northeastward. Coastal plain backed by rolling foothills. 1935.

(5) Landing beaches.

(a) Sumlug Point beach. (PLANS 28 and 30, Section F(s)) Reliability FAIR. A nearly continuous sand beach extends from Arena Point southeastward past Sumlug Point to the settlement of Cuabo, a total distance of about 8 miles. The limits of the beach lie at 6° 56′ 20″ N, 125° 58′ 40″ E, and 6° 51′ 50″ N, 126° 04′ E. Arena Point is low and flat, but appears as a sharp point extending far out from the coast. Sumlug Point is prominent because of the dry sand bar off the mouth of the Sumlug River. Northward of this area in Mapanga Bay may be a few small beaches, but data are inexact and conflicting.

The offshore approach to the area is obstructed by several shoals which lie within a radius of 2 miles of Sumlug Point and extend eastward into Cuabo Bay. Within the 30-foot depth the bottom slope is usually gentle with numerous shoal and bar areas opposite the mouth of the Sumlug River. A fringing coral reef lies about 1 mile south of Arena Point, and another begins a short distance southeast of Cuabo. The bottom materials are mainly sand and mud with some rocky patches. The beach is exposed to southwest winds and waves. The average range of the tide is about 4 feet and the flood tidal current moves northwestward along the shore.

The beach between Arena Point and Cuabo is interrupted by the mouths of several streams. The Lupon River flows parallel to the coast for about 1 mile, so that here the beach forms a long spit. At Sumlog the beach widens to several hundred feet at low tide, but may locally be muddy and soft. Eastward of Sumlug Point the beach continues relatively wide, but is interrupted by 2 streams, both of which flow parallel to the shore near their mouths. The beach is composed of sand, mainly of non-coral origin (Figure IV - 212). It is generally fine. The slope of the beach varies from about 1 on 6 near Arena Point to flatter than 1 on 25 near the Sumlug River. No structures occur along this beach. The shore drift is variable, but tends to move northwestward and southeastward from Sumlug Point as a center. Surf may be heavy over a broad belt when swell approaches from the southwest.

The villages of Lupon, Sumlog, and Cuabo are connected by a trail which parallels the coast; from Cuabo the trail runs inland across heavily wooded hills to Pujada Bay. Native houses line the beach at Sumlug Point. A road also runs inland from Lupon, joining a system of trails along the Sumlug River. The general terrain along the coast is low and wooded, with some marshy and mangrove areas between Sumlug Point and Cuabo.

(b) Cuabo Bay beaches. (PLAN 30, Section F(t); U.S.C. and G.S. chart 4624; FIGURE IV - 212) Reliability GOOD.

1. Location and extent. Two interrupted beaches extend along a 13-mile stretch of coast from Sumlug Point to Talisay Bay. The northern beach, a continuation of Sumlug Point beach described above, runs eastward and southward from Sumlug Point for 6 miles to Bato Point; the southern beach extends from 3 miles north of Bitaogan Point to the shore of Talisay Bay, 2½ miles southeast of that point. The northern limit of the beach area lies at 6° 52′ 30″ N, 126° 01′ 30″ E; and the southern limit lies at 6° 44′ 40″ N, 126° 05′ 30″ E. Bato Point, near the center of the area, is the abrupt end of a ridge 400 feet high, and serves as a landmark.

2. Nearshore. The approach to Cuabo Bay and the shore southward is obstructed by numerous reef and shoal areas which are scattered through the bay area and extend along the shore about 3 miles west of Bitaogan Point. Of these Talisay Reef, which is bare at low water, is the largest. It lies 3½ miles south-southwest of Bitaogan Point. Nearshore the bottom slopes are gentle from Sumlug Point to Cuabo, with the 30-foot depth lying about 1,500 feet from shore. Shifting sand bars lie near the mouth of the Cuabo River. South of Cuabo a fringing

FIGURE IV - 211. *Davao Gulf, E shore.*
Mouth of Cuabo River.

coral reef fronts much of the shore except at Bitaogan Point; this reef attains a maximum width of about 1,000 feet in its northern portions, and has shoal areas skirting it. The bottom material along this landing area is mainly coral mud with some rocky patches. The beaches are exposed to winds and waves from the southwest and south. The average range of the tide is about 4 feet and the flood tidal current moves northward and westward along the shore.

3. Character of the beaches. The northern beach, from Sumlug Point to Bato Point is interrupted at several places along its extent. The mouths of the Tibauan and Cuabo Rivers interrupt the strand at Cuabo (FIGURE IV - 212) and about 1 mile westward, and an area of swamp interrupts the beach about 1 mile southeast of Cuabo. Both of the rivers which interrupt the beach are parallel to the shore near their mouths, leaving the beaches on narrow necks of land. Near Sumlug Point and as far east as Cuabo the beach is fronted by a sand flat a few hundred feet wide near its western end, but increasing to about 1,000 feet near Cuabo. This part of the beach is composed mainly of non-coral sand, and has a rather flat slope, especially near the low water line. Southeast of Cuabo the beach is fronted by a fringing coral reef averaging about 500 feet wide, and here the beach material is coral sand and debris, with an average slope of about 1 on 10. All parts of the northern beach are relatively firm except portions of the sand flat and parts of the beach near the river mouths. The southern beach, which extends on both sides of Bitaogan Point, is also of mixed composition. It is of coral origin and is fronted by a fringing coral reef except in the vicinity of the Bitaogan River. Here the debris carried down by the river dominates the composition, and the material becomes coarse, locally cobbly. Slopes along this southern beach are moderate, averaging 1 on 10 along the coral portion, and decreasing toward the mouth of the Bitaogan River, which interrupts the beach continuity. In general the southern beach also is firm, although local soft spots may occur near the river mouth. No structures are known along any of the beaches in this landing area. Surf may be heaviest along the part of the beach between Sumlug Point and Cuabo when swell runs from the south. Shore drift is variable, but is predominantly eastward and southward close to shore.

4. Terrain inland and adjacent to beaches. From Sumlug Point eastward and southward nearly to Bitaogan Point the inland terrain is a broad coastal plain backed by more rugged mountainous country. At Bitaogan Point the hills approach the gulf shore, but south of that point a small coastal plain again borders the beach area. The plains and hilly country are generally heavily wooded with patches of grass. Coconut plantations occur locally along the shore as at Cuabo and southward to Bitaogan Point. Areas of mangrove or swamp occur along the lower courses of the Cuabo and Tibauan Rivers, as well as in smaller patches immediately behind the beach. In terms of communications the settlement of Cuabo appears to be the most favorable part of this area for operations. A trail leads from Cuabo northwestward to connect with a trail which runs along the shore of Davao Gulf to its head. Another trail leads eastward from the settlement, running across the peninsula about 18 miles to Mati on the shore of Pujada Bay. It is not known whether trails lead southward along the shore to join other parts of the beach beyond Cuabo.

(*c*) *Bais Point beaches.* (PLAN 30, Section F(u)) Reliability FAIR.

For a distance of 4 miles north and about 7 miles south of Bais Point are several beaches separated by short rocky stretches. The northernmost beach at La Union is about 1 mile long. The central beach which fronts Bais Point is 7 miles long. A small beach occurs at Monserat, and the southernmost, which lies between Salun and Lilisan Points, is about 1 mile long. The northern limit of La Union beach lies at 6° 42′ 40″ N, 126° 45′ 10″ E, and the southern limit of the southern beach is at 6° 34′ 40″ N, 126° 45′ 10″ E. Bais Point is low and rounded; Borot

FIGURE IV - 212. *Davao Gulf, E shore.*
Narrow sandy beach and houses at Cuabo, at mouth of Cuabo River.

Point shows as a white slide; and Lilisan Point is steep and prominent.

The approach to this shore is obstructed by numerous reefs, which lie in a zone within 1 mile of the shore. Borot Reef and Sigaboy Island are noteworthy. Within the 30-foot depth the bottom slopes are moderate and steep to the narrow fringing coral reef which fronts much of the shore. The bottom materials are mainly coral sand and mud. The beach area is exposed to the western quadrant and is subject to winds and waves from the southwest. The mean tidal range is about 4 feet, and the flood tidal current moves northwestward along the shore.

The beaches along this stretch are composed of coral sand. They are relatively narrow and firm, and their slopes vary between 1 on 6 and 1 on 10. No structures occur along the beaches. Surf is heavy when swell approaches from the southwest, and shore drift, although variable, is predominantly northward.

The terrain behind the beaches consists of an alternation of coastal and river plains separated by local areas where hills approach the sea. The settlements of La Union, Sigaboy, and Monserat lie along the coast, and a shore trail connects Sigaboy with La Union. There are coconut groves near the villages, but the native vegetation is mainly woods and scattered patches of grass.

(d) Tiblawan beach. (PLAN 30, Section F(v)) Reliability FAIR.

A stretch of coast 14 miles long, from Lilisan Point to Kaganuhan Point, centering at the village of Tiblawan, is fronted by a nearly continuous sand beach, generally narrow, but locally widening to nearly 100 feet within some of the small bays. The limits of the area lie at 6° 34′ 20″ N, 126° 05′ E, and 6° 23′ 30″ N, 126° 08′ E. Lilisan Point is steep and about 100 feet high; an extensive coconut grove shows prominently from seaward at Tiblawan; and at Kaganuhan Point 6 hills rise in an ascending series.

The approach to the shore along nearly this entire stretch is fronted by detached shoals lying mainly along a scattered belt within 1 mile of the shore. The coast south of Nangan Bay has a clear approach. Within the 30-foot depth the bottom slopes are irregular and shoal, rising in places steeply toward the fringing coral reef which fronts much of the shore. The bottom material is mainly coral sand and mud with some rocky areas. The coast is exposed to the west and to winds and swells from the southwest. The mean tidal range is 4 feet and the flood tidal current moves northward along the shore.

The beach is composed mainly of coral sand with mixtures of non-coral sand near the streams, especially the Magdug River and Tiblawan Creek. The beach is also interrupted by stretches of mangrove swamp for about 4 miles south of Padada Point. The beach is generally firm and has slopes ranging from 1 on 5 to 1 on 10, with the steepest portions along the narrowest parts. No structures are known along this part of the coast. Surf may be heavy during southwest swell. Shore drift is variable but is predominantly northward.

The terrain inland is a coastal plain of variable width, generally heavily wooded, and locally marshy or swampy along the streams near the shore. Coconut plantations occur at the villages, which include Magdug, Luzon, Tiblawan, Nazaret, Kalaguhan, and Surup. No trail is known along the shore, but an inland trail leaves Nazaret to the hilly country farther east.

(e) Pondaguitan beaches. (PLAN 30, Section F(w)) Reliability FAIR.

Some half-dozen scattered coral beaches, the longest about 1 mile long, line the eastern shore of Davao Gulf between Kaganuhan Point and Cape San Agustin, which lie respectively at 6° 23′ 30″ N, 126° 08′ 00″ E, and 6° 16′ 20″ N, 126° 11′ 30″ E. Kaganuhan Point, with 6 hills in an ascending series, and Cape San Agustin, where there was a light 132 feet above the sea, form landmarks for the limits of the area.

The approach to this part of the coast is clear to the 30-foot depth except where San Agustin Reef extends nearly 1½ miles southward of Cape San Agustin. Within the 30-foot depth a fringing coral reef lines the shore continuously. This fringing reef has areas of shoal water in front of it in places, but generally the bottom slopes rise rather rapidly to the reef. The reef attains a maximum width of about 1,500 feet near Kaganuhan Point and north of Lima Point, but the average width in front of the beaches is probably less than 500 feet. The bottom materials are coral sand and mud. The area is exposed to the west and southwest, and is subject to swell from the southwest. The mean tidal range is about 4 feet, and the flood tidal current moves northward along the shore.

All the beaches are composed of coral sand with some mixed coral debris. They are firm, with slopes averaging between 1 on 6 and 1 on 10. No structures are known to exist along any of the beaches. Surf may be moderately heavy when swell is running, and shore drift, although variable, is mainly northward.

The beach area is backed mainly by hilly or mountainous terrain, with a narrow coastal plain lining parts of the shore, as at Pundaguitan. The country is generally wooded, with some local groves of coconut palms along the shore, and mangrove swamp in places, as between Kanikian Point and Lima Point. No trails are known in this area.

U. Davao Gulf Area: Cape San Agustin to Pusan Point

(PLAN 30; U.S.C. and G.S. charts 4608, 4624, 4625, and 4626)

(1) Offshore zone.

The coast is steep-to, with the 10-fathom line not over ¾ mile, and generally only ⅛ to ⅛ mile, from shore. The nearshore bottom sediments consist predominantly of sand and occasional coral patches, while the offshore sediments are almost entirely composed of muds.

A constant southward current exists off the east coast of Mindanao, especially beyond 4 miles from shore. Inshore the current is locally deflected into eddies by the tides, but it remains constant off the projecting points. Near the coast the sea is always very rough and choppy. Heavy tidal rips and swirls are encountered around Luban Island and southward. In Mayo Bay the tidal currents are weak, but at the entrance they conflict with the southerly current, here having a velocity of 2.2 knots, and frequently produce heavy tide rips and much disturbed water. Northward from Mayo Bay the southward current manifests itself in strong races, which increase in velocity toward Pusan Point, where they attain their greatest force. Heavy rips and swirls are especially frequent off Casauman Point and are encountered off Pusan Point even in moderate weather.

(2) Coastal topography.

From Cape San Agustin the coast trends approximately 8° true for 30 miles to Tumadgo Point. The northern half of this stretch of coast is characterized by steep, cliff-bordered points, from which the land rises rapidly to the higher mountains in the

interior. The cliffs, composed of soft rock, are undermined by the heavy seas during storms. The fallen rock forms huge boulders on a narrow ledge between the high water line and the foot of the cliffs. Between the points, narrow valleys, not conspicuous from seaward, rise steeply inland.

About 3 miles northward of Lagum Point there is a decided change in the character of the vegetation. To the southward the trees are stunted, and from a distance offshore the many large-leafed palms have the appearance of nipa houses. To the northward the country is heavily wooded with large trees and has a decided jungle appearance.

Luban Island, 219 feet high, has an almost perpendicular cliff along its eastern side, but gradually slopes to a mangrove-fringed shore on its western side. A large rock, 25 feet high, lies close to the cliff face. The island is connected to the mainland by a coral reef that bares at low water. At high water small launches, drawing not more than 4 feet, can pass between the island and the mainland into a small lagoon in front of the town of Luban. Entrance to this lagoon from the south is made difficult by numerous boulders on the reef. A large rock, 10 feet high, lies on the edge of the shore reef ⅔ mile eastward from the village of Kabuaya.

Between Kabuaya and Tumadgo Point the most conspicuous promontories are Salasala, Nagas, and Macaonan Points. Tumadgo Point is a crumbling cliff with a height of about 800 feet. Back of the point the land rises in irregular ridges to Mount Hamiguitan, 5,345 feet high. Makumbol and Magun are 2 small unimportant settlements on the southwest shore of Pujada Bay.

Pujada Bay (U.S.C. and G.S. chart 4625), 6 miles wide at the entrance between Tumadgo and Lamigan Points, extends 12 miles northwestward. The entrance quickly narrows to a width of 4 miles, and is divided into 2 deep, clear channels by Pujada Island. The land around the entrance points and on the southwestern and northwestern sides of the bay rises steeply from the water's edge. The shore is bordered by a coral reef which is narrow except at Taganilao, where the reef extends ⅗ mile from shore. The land on the northeastern side of the bay, from Batiano Point northward, is low and fringed by a broad coral reef up to ¾ mile wide. (FIGURES IV - 213 to IV - 223)

Pujada Island is 1⅓ miles long, ½ mile wide, and 485 feet high. The southern end of the island is covered with second growth timber, but the northern end has been cleared and planted to coconuts. The shore reef, which is about 100 yards wide along the western side of the island, gradually widens to about 200 yards at the northern end, and attains its greatest width of 400 yards off the southeastern end. The island forms an excellent landmark for entering the bay (FIGURE IV - 224). Two small sand islets, rising from coral reefs which bare at low water, lie ¾ and 1½ miles southeast of Pujada Island. They are separated from each other by a narrow, foul channel, and from Pujada Island by a channel ¼ mile wide and 4 fathoms deep. Both islets are conspicuous from seaward.

Balete Bay (FIGURE IV - 225) lies in the northwestern corner of Pujada Bay. Its head is bordered with wide coral reefs, backed by mangroves. The gently sloping valley leading inland from the bay head is not occupied by a river. Bajucan is a small Moro settlement on the southwest side of the bay. Tataidaga and Daca Points are the southeast and southwest extremities, respectively, of the peninsula which separates Balete Bay from Pujada Bay. The alternation of cogon grass and woods gives the headland between the points a streaked appearance which is conspicuous from seaward. Since shoal water extends for some distance off these points, they should be given a berth of at least ½ mile. Lacutan Cove has a very irregular shoreline and is fringed by a wide coral reef. (FIGURE IV - 217)

The northwestern coast of Pujada Bay is steep-to, high, and heavily wooded. Cabayan Point is high, rounded, and rocky. A detached rock lies ½ mile eastward of Camansi Point. The small indentations northward and southward from the point are filled by fringing reefs.

Mati (FIGURE IV - 219), the most important town in this vicinity, lies at the head of Pujada Bay and is chiefly inhabited by Visayans. Mati Light, 6° 57′ 04″ N, 126° 13′ 01″ E, was exhibited at an elevation of 36 feet from a white concrete tower at the shore end of the pier.

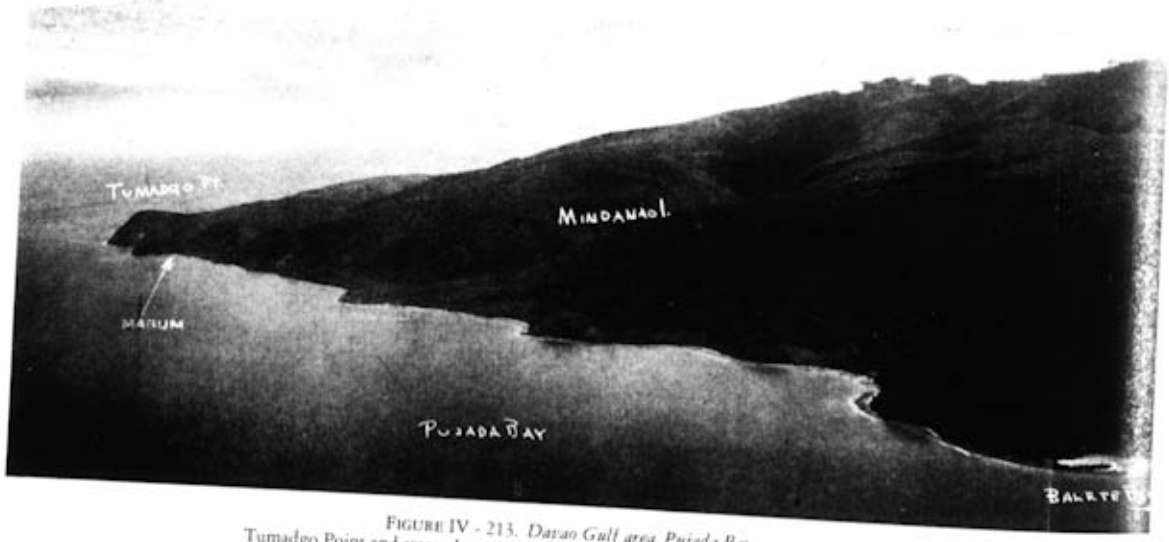


FIGURE IV - 213. *Davao Gulf area, Pujada Bay.*
Tumadgo Point and steep slopes rising from S shore of Pujada Bay, looking S. 1935.

FIGURE IV - 214. *Davao Gulf area, Pujada Bay.*
Beach at Makumbol, on SW shore of Pujada Bay, backed by steep hills. Looking southwestward. 1935.

Babiasan, at the mouth of Guanguan Estero, is a small Moro settlement. Guanguan Estero is entirely filled by coral reefs which extend over ¾ mile offshore between Licoc Point and Guanguan Point.

Uanivan Island, 105 feet high and covered with trees, lies on the east side of the bay about ¾ mile northwest of Taganilao Point (FIGURE IV - 221). The island is connected with the point by a reef under 5½ fathoms of water. A sandy beach fringes the eastern side of the island, but the western shore is rocky. A wide coral reef, which bares at low water, extends ¼ mile southeastward from the island.

Lamigan Point (FIGURE IV - 223), 6° 49' N, 126° 21' E, forms the southeastern end of Guanguan Peninsula, which separates Pujada Bay from Mayo Bay. It terminates in a very bold, sheer cliff, 108 feet high. The 1,825-foot hill behind the point is a very conspicuous landmark for vessels approaching Pujada Bay. Although the hill is over-topped by higher mountains to the westward, its isolated position permits easy identification.

Mayo Bay is a deep, open, body of water between Lamigan Point and Tugubun Point (FIGURE IV - 226). Bobon Point, at the southern end of the bay, is low and rounded. The southern and western shores of the bay are low, flat and heavily wooded. They are bordered by a prominent shingle beach overlying a coral reef, except in the small bay south and west of Gorda Point, which is fringed by a broad sand beach. Gorda Point is low, rounded, and composed of uplifted coral ledges.

Steep, heavily wooded mountains rise from the water's edge along the north side of Mayo Bay. A narrow coral reef borders the entire north shore. With the exception of Tacaquinay Point, the points consist of low coral cliffs, flanked by sand and shingle beaches. Tacaquinay Point consists of sheer cliffs of hard conglomerate 200 feet high rising from the water in 4 distinct headlands separated by deep gorges. At Magbiga Point, between Flacca and Tugubun Points, rocky coral ledges are prominent. Mount Ambutig, 1,940 feet high, with a sharp, grass-covered top, is conspicuous from seaward and especially easy to identify when seen against the sky.

The principal settlements are Mayo, in the northwest angle of the bay, and Lucatan on the north shore; both are inhabited by Mandayans.

From Tugubun Point the coast trends north-northeastward for 20 miles to Pusan Point. The intervening points are coral cliffs, 15 to 30 feet high, flanked by sand and shingle beaches at the heads of the bays. The bays are all open to the eastward and southward. The coastal foothills behind the shore form a somewhat broken ridge, which is without prominent landmarks. This ridge is separated from the higher mountains inland by a valley 400 to 500 feet deep. The entire coastal region is heavily wooded.

Tarragona, at the head of the bight between Tugubun and Yaco Points, Holy Cross (Santa Cruz), at the head of the small bay between Buan and Casauman Points, and Manay, at the head of the bay between Manaol Point and the next point southward, are the principal ports of call. Jovellari is a Mandayan settlement about 1 mile westward from Yaco Point. Quinonoan, San Ignacio, and Zaragosa are Visayan settlements. Hemp fields and coconut groves interrupt the woods around these villages.

The Casauman River, 1½ miles north of Casauman Point, can be entered by small boats at low water. Just in front of the river mouth is a high shingle ridge, cast up by the heavy seas that prevail much of the time along this coast.

The Manay River, at the head of Manay Bay, can be entered by small boats, but rapids block the channel a short distance from its mouth. A 38-foot rock, close to the cliff at the end of Manaol Point, makes an excellent landmark from the northward or southward.

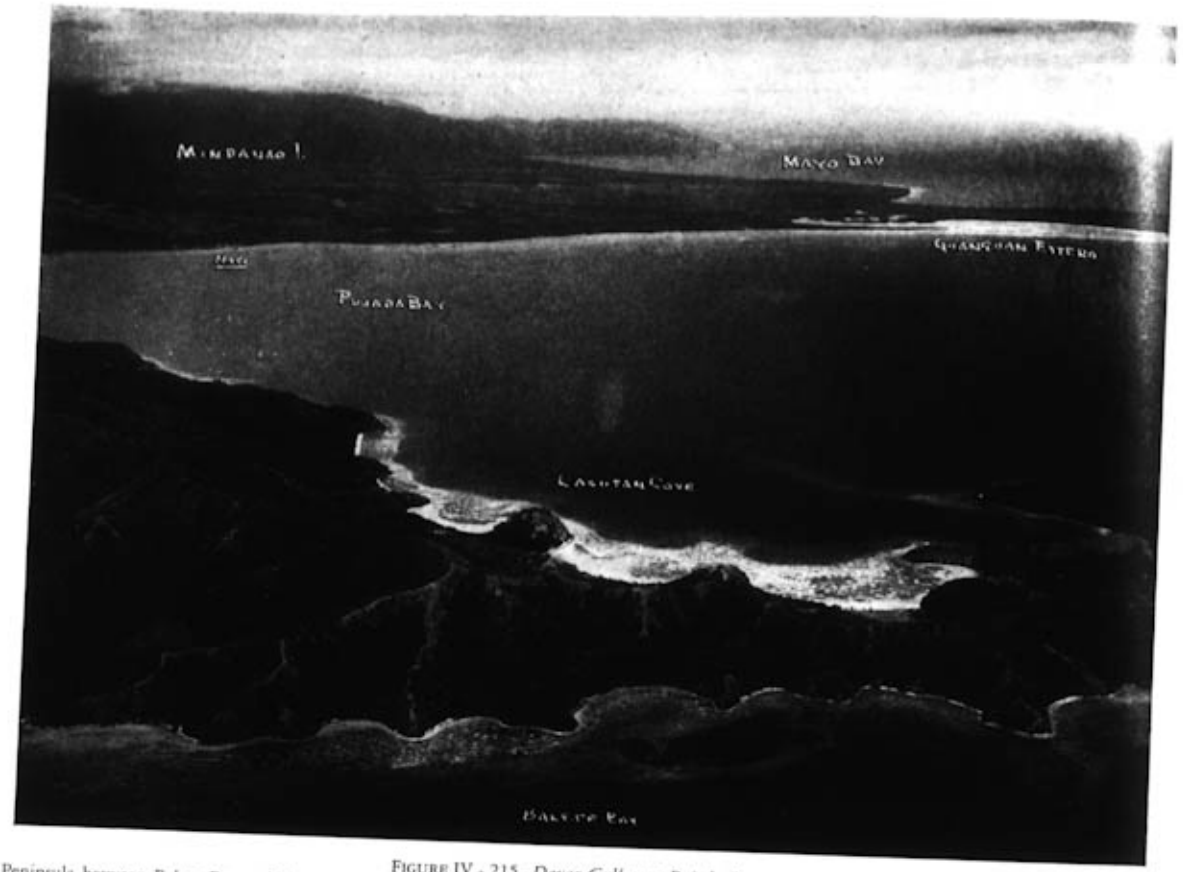


FIGURE IV - 215. *Davao Gulf area, Pujada Bay.*
Peninsula between Balete Bay and Lacutan Cove, looking east-northeastward across head of Pujada Bay. Crescentic pocket beaches and fringing coral reef.

FIGURE IV - 216. *Davao Gulf area, Pujada Bay.*
Balete Bay and its steep mountain wall, looking southwestward. Broad fringing reef, backed by mangrove at head of bay. 1935.

FIGURE IV - 217. *Davao Gulf area, Pujada Bay.*
NW part of Pujada Bay, looking northwestward, showing Balete Bay, Lacutan Cove, and peninsula between. Alternating areas of forest and cogon grass on peninsula. Pocket beaches in Lacutan Cove. 1935.

FIGURE IV - 218. *Davao Gulf area, Pujada Bay.*
Camansi Point and vicinity, head of Pujada Bay, looking northeastward. 1935.

FIGURE IV - 219. *Davao Gulf area, Pujada Bay.*
Head of Pujada Bay, vicinity of village of Mati, looking northward. Note narrow beach, and fish trap on broad coral reef at right. 1935.

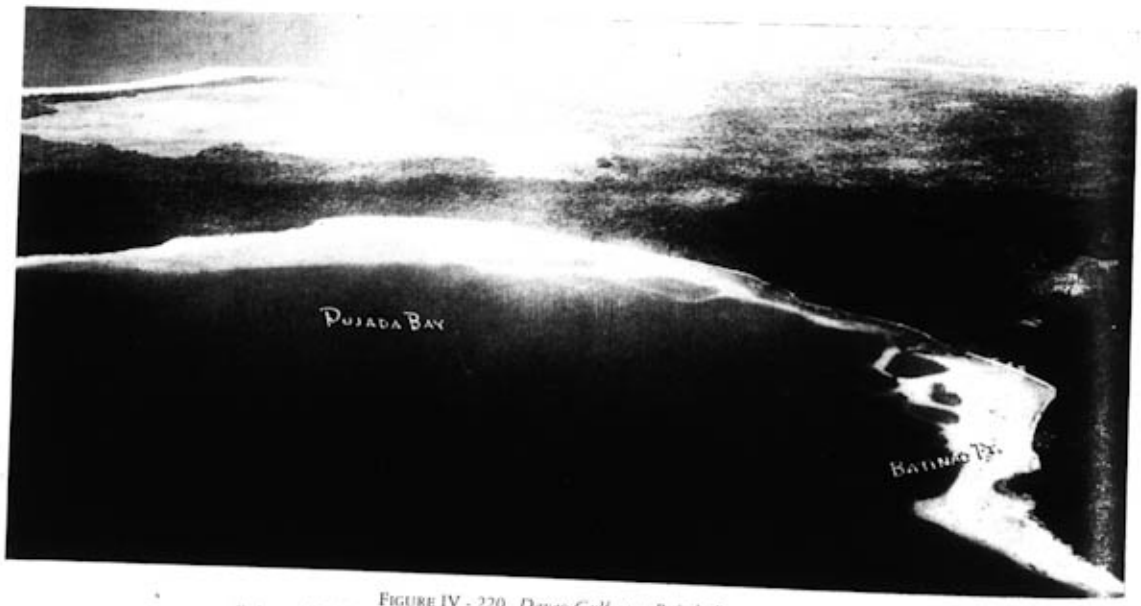


FIGURE IV - 220. *Davao Gulf area, Pujada Bay.*
E shore of Pujada Bay, northwestward of Batiano Point, looking northeastward. 1935.

Batinao Point is a high, rounded, coral cliff, northward from which lies Bunga Cove. At the head of the cove is a small semi-circular basin which can be entered by launches. Bunga Creek empties into this basin.

Pusan Point, 7° 17′ N, 126° 36′ E, is low, rounded, and steep-to.

(3) Anchorages.

From Cape Agustin to Tumadgo Point there are no good anchorages, but in case of necessity, anchorages may be had at several localities.

Pujada Bay (U.S.C. and G.S. chart 4625) is well sheltered, but is too deep to afford good anchorage.

Balete Bay (FIGURE IV - 225) affords perfectly protected anchorage for small vessels. Anchorage is available in 16 to 20 fathoms beyond the shoal lying in the entrance channel about ¾ mile northwestward of Daca Point, or near the head of the bay in 8 fathoms, mud bottom.

FIGURE IV - 221. *Davao Gulf area, Pujada Bay.*
Rugged terrain on SE side of Pujada Bay, S of Batiano Point, 1935.

For anchorages off Mati, see Chapter VI.

One mile northward of Batiano Point good anchorage may be had in 15 to 20 fathoms, ½ mile offshore.

Mayo Bay affords no protected anchorage and only very precarious anchorage in fair weather.

From Tugubun Point to Pusan Point no anchorage protected from easterly weather is available. The bays between Yako, Tambuc, Manduao, Buan, and Casaunan Points afford indifferent anchorages, all of which are open to eastward and southward.

Manay Bay offers anchorage westward of Manaol Point protected from west through north to northeast.

(4) Dangers to navigation.

About ⅓ mile northwestward from Daca Point, the entrance channel to Balete Bay (FIGURE IV - 225) is narrowed to 200 yards by a shoal under a least known depth of ¼ fathom.

A 3½-fathom shoal lies nearly in the middle of Lacutan Cove.

The only known danger in Mayo Bay is a small coral reef, baring at half tide, which lies ¼ mile southeastward from Flaca Point, on the north shore of the bay. The channel between this reef and the shore reef has a depth of over 3 fathoms.

The only detached danger between Tugubun and Pusan Points is a coral shoal lying 2¼ miles north of Tugubun Point and ¾ mile offshore. It is connected with the shore reef, and has a least depth of 1½ fathoms. A second detached shoal lies ¼ mile eastward from the first under a depth of 4¾ fathoms.

(5) Landing beaches.

(a) Lagum Point beaches. (PLAN 30, Section H(a)) Reliability 1:31R. At least 3 beaches, generally coarse and locally cobbly, lie between Cape San Agustin (6° 16′ 20″ N, 126° 11′ 30″ E) and a point about 1¾ miles southwest of the settlement of Luban (6° 24′ 35″ N, 126° 12′ 25″ E). The first beach extends interruptedly for about 1 mile northeast from Cape San Agustin; the second is about ½ mile long and lies about ¾ mile south of Lagum Point; and the third extends for 5½ miles from about 1 mile north of Lagum Point to the northern limit of this area, with at least one interruption by rocky cliff. Cape San Agustin is the termination of a high range of hills which decreases in height and ends at the cape in a rocky bluff about 20 feet high.

The offshore approach to the beaches is clear and within the 30-foot depth the bottom slopes are moderate to the fringing coral reef which completely lines the shore. The bottom gradient steepens somewhat for a distance of about 2 miles south of Lagum Point. The fringing reef varies in width from about 300 to 800 feet. The beaches are exposed to the eastern quadrant, and heaviest winds and waves occur during the winter months when the direction of approach is mainly from the north and northeast. The mean tidal range is about 4 feet and the flood tidal current moves southward. Outside of about 1 mile from the shore, a constant southerly current is felt.

The beaches are composed of coral sand and debris, ranging in size up to cobbles. They have steep slopes averaging about 1 on 8, and they are firm. Surf may be heavy along these beaches when northeast swell strikes the shore. Shore drift is mainly southward. No structures are known along any of the beaches.

The terrain behind the beaches is generally steep, with cliffs locally lining the shore. The hilly or mountainous country inland is heavily wooded, but the vegetation changes from a generally stunted type to more robust forms near Lagum Point, with the stunted forms to the southward. There are no villages along this part of the coast, and no trails are known to exist. It is doubtful whether there is communication between the several beaches along the shore.

(*b*) *Luban beach.* (PLAN 30, Section H(b)) Reliability FAIR. At the village of Luban is an interrupted sand beach about ½ mile long and relatively narrow. The village lies at 6° 25′ 40″ N, 126° 13′ E. Luban Island, 219 feet high, lies opposite the village.

The approach to the beach is partially obstructed by the island, and a fringing coral reef along the shore connects the island with the mainland. The bottom material is mainly coral sand. The beach is partially exposed to the southeast, but is largely sheltered by the island. The average tidal range is about 4 feet, and the flood current moves southward along the shore. Tide rips occur offshore from Luban Island; southward, tide rips and swirls may be encountered.

The beach is composed of coral sand. It is interrupted by a mangrove area behind Luban Island. The beach is narrow at high tide, but is firm and has a slope of about 1 on 10. No structures occur along the beach. Surf may be heavy along the southern part of the beach. Shore drift is variable, but may be predominantly northward.

A fringe of coconut palms lines the beach. The terrain inland rises in moderate to steep slopes to the mountainous interior. The slopes are densely wooded. No trails are known in this vicinity. Southward of Luban the coast continues rugged and steep and is lined by a fringing coral reef.

(*c*) *Kabuaya beach.* (PLAN 30, Section H(c)) Reliability FAIR. At the settlement of Kabuaya is a sand beach extending about 1½ miles southward along the shores of a small bight. The limits of the beach lie at 6° 31′ 10″ N, 126° 13′ E, and 6° 30′ N, 126° 12′ 50″ E.

The approach to the beach is clear, but the nearshore area is fronted by a fringing coral reef at both ends of the beach. This reef either is not present at the beach itself, or it is debris covered. The bottom materials are coral sand and mud. The beach is exposed to the east and during the northeast monsoon the southern portion is subject to heavy swell. The average tidal range is 4 feet and the flood tidal current moves southward along the shore. Tide rips are encountered near some of the headlands along this part of the coast.

The beach is composed of coral sand. It is locally more than 100 feet wide at low tide, but is relatively narrow during high water. The beach is firm, with an average slope of about 1 on 15 to 1 on 20, steepening to the south. No structures are present. Surf is heaviest along the southern part of the beach when swell approaches from the northeast.

The beach is backed by a narrow coastal plain. Coconut groves line the shore near the village of Kabuaya, but the surrounding hill slopes are densely wooded. No trails are known in this vicinity. This stretch of coast is also marked by scattered beaches. Southward of the sandy beach is a narrow strand of shingle and coral debris at the base of steep cliffs.

(*d*) *Salasala Point beaches.* (PLAN 30, Section H(d)) Reliability FAIR. From a point about 2 miles south of Salasala Point northward to a few miles beyond Macaonan Point, a total distance of about 15 miles, there are numerous sand and pebble beaches with material locally ranging up to cobble size. The limits of the area lie at 6° 31′ 40″ N, 126° 13′ 30″ E, and 6° 43′ 40″ N, 126° 14′ 50″ E. Most of the beaches are short. The

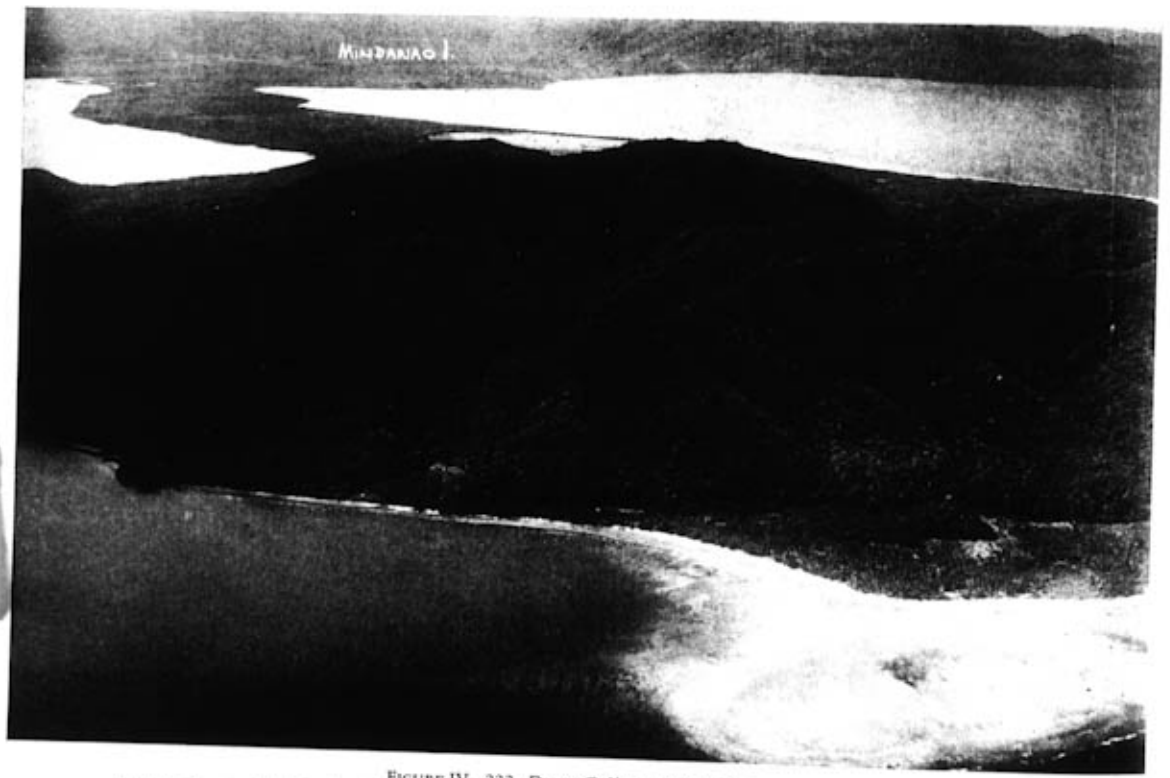


FIGURE IV - 222. *Davao Gulf area, Pujada Bay.*
Looking N across hilly S end of Guanguan Peninsula to Mayo Bay. Broad fringing reef of Taganilao to right. 1935.

FIGURE IV - 223. *Davao Gulf area, Pujada Bay.*
Broad fringing reef and coral beach of Taganilao W of Lamigan Point, looking northeastward. Mayo Bay in background. 1935.

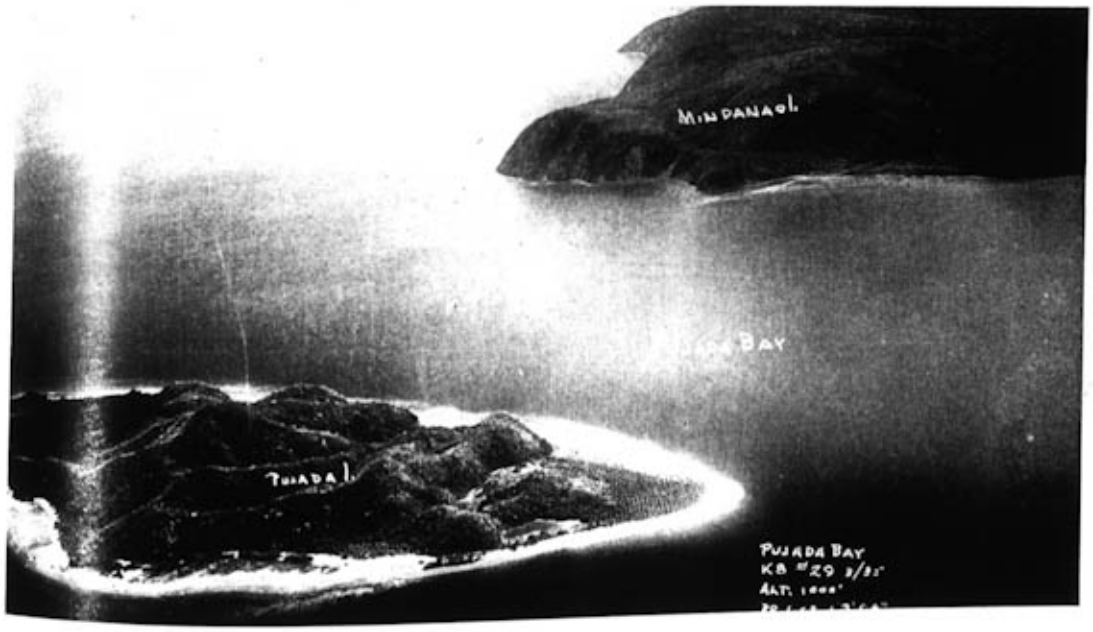


FIGURE IV - 224. *Davao Gulf area, Pujada Bay.*
Pujada Island, in the entrance of Pujada Bay, and Tumadgo Point, at the S terminus of the Bay, looking southward. 1935

longest, immediately north of Salasala Point, is about 1½ miles in length.

The offshore approach to this entire area is clear to the 30-foot depth which generally lies close to the narrow fringing coral reef which extends almost continuously along the shore. Bottom materials are mainly coral sand near shore, with a few rocky patches. The area is exposed to winds and heavy swell from the northeast and east during the northeast monsoon. The mean tidal range is about 4 feet. The flood tidal current moves southward along the shore and tide rips are encountered off some of the rocky points. There is also a general southerly drift current along the shore.

The beaches are all composed predominantly of coral material. The particles range in size up to large cobbles, and some of the beaches are reported to be composed almost wholly of cobblestones. Some of the beaches lie along the open coast and others are sheltered in small bights or coves. The beaches are all firm and have slopes generally steeper than 1 on 10. No structures are known on any of the beaches. Surf is heavy when northeast swell strikes the shore. Shore drift is southward.

Inland of the beaches the terrain generally rises rather abruptly to a steep mountainous interior, but some of the beaches front river plains or limited flood plains such as those about 2 miles north of Nagas and Macaonan Points. Only a single village, located a short distance from Salasala Point, is known along this shore, and no information is available regarding trails or other communications. The vegetation is dense woods for the most part.

(*e*) *Magum beach.* (PLAN 30, Section H(e)) Reliability FAIR. A narrow, coral beach about ½ mile long is located at Magum near the western entrance to Pujada Bay (FIGURE IV - 124). It is located at 6° 46′ 20″ N, 126° 14′ 50″ E. Tumadgo Point about 2 miles south is a crumbling cliff rising about 800 feet.

The approach to the beach is clear between the mainland and Pujada Island. A wide fringing coral reef fronts the southern part of the beach, but narrows appreciably toward the northwest. The bottom material is mainly coral sand. The beach is exposed to the northeast, but is partially sheltered by Pujada Island. The average tidal range is 4 feet and the flood tide moves northwestward.

The beach is composed of coral sand, and landings may be made just north of the village of Magum at any stage of the tide. The beach is firm and has a slope of approximately 1 on 6. There are no structures on the beach. Surf is generally light. The beach is backed by a limited river plain rising to steep densely wooded hills. No trails are known to occur in this vicinity.

(*f*) *Pujada Island beaches.* (PLAN 30, Section H(f)) Reliability FAIR. Pujada Island, at the mouth of Pujada Bay, is about 1¾ miles long. It extends southeastward from 6° 47′ 35″ N, 126° 15′ 25″ E, to 6° 46′ 40″ N, 126° 16′ 25″ E. The island is strategically important because it commands the entrance to Pujada Bay. A coral-sand beach lines much of the island; the beach is interrupted at several points by areas of mangrove or by short stretches of cliff.

The offshore approach to the island is clear except for 2 coral reefs with sand islands which lie within ½ mile southeast of the island. Within the 30-foot depth the bottom slopes are moderate along the western shore of the island to the fringing coral reef. The slopes flatten somewhat along the eastern shore. The fringing coral reef entirely surrounds the island. The reef is relatively narrow, but attains a maximum width of 1,000 feet at the southeastern end. The island is exposed to heaviest swell from the south, and wave action is relatively light along the northern tip. The mean tidal range is about 4 feet and the tidal current moves into Pujada Bay on flood.

The beach is composed mainly of coral sand. It is relatively wide, with the widest portions along the northwestern tip of the island (FIGURE IV - 124). The beach is firm and has a slope varying from 1 on 8 to 1 on 10. No structures occur along the beach, and shore drift is generally northward along both sides of the island.

Behind the northern tip of the island is a small area of lowland cultivated in coconut palms. Just southward of this area along the eastern shore the beach is backed by a small lagoon (FIGURE IV - 124). Other small areas of coconut groves lie behind the beach along the eastern shore, and the interior of the island is hilly and densely wooded. No trails are known.

(*g*) *Makumbol beach.* (PLAN 30, Section H(g)) Reliability FAIR. At the settlement of Makumbol along the west shore of Pujada Bay is a narrow sand and debris beach about 1 mile long (FIGURE IV - 214). It is located at 6° 50′ 10″ N, 126° 11′ 40″ E.

The approach to the beach is clear to the 30-foot depth; within this depth the bottom rises moderately to the narrow fringing coral reef which fronts the area. The beach is exposed to winds and waves from the northeast. The mean range of the tide is about 4 feet and the flood tide moves northwestward along the coast. Bottom material is mainly coral sand.

The beach is composed of coral sand and fragments, and is interrupted by rocky ledges. The beach is firm, with a slope of about 1 on 8, and lacks man-made structures. Moderate surf may develop during northeast winds.

The beach is backed by coconut palms along the shore. A small coastal plain lies behind the village and beach area. A trail leads northwestward along the shore to a cross trail which connects the town of Mati on Pujada Bay with Cuabo on Davao Gulf.

Two other small coral beaches lie within a distance of 2 miles southeast of the village.

(*h*) *Lacutan Cove—Balete Bay beaches.* (PLAN 30, Section H(h)) Reliability GOOD. The promontory which lies between Lacutan Cove and Balete Bay at the head of Pujada Bay has a number of small pocket beaches scattered along its coast (FIGURE IV - 215). Most of these beaches are between 1,000 and 2,000 feet long and vary in width from narrow strands to about 200 feet wide at low tide. The limits of the beach area lie at 6° 54′ 50″ N, 126° 11′ E, and 6° 54′ 30″ N, 126° 09′ 40″ E. The headland at the end of the promontory is partially grass covered and has a streaked appearance (FIGURE IV - 217). The shoreline of the promontory is lined with a continuous coral reef which varies considerably in width.

The approach to the beaches is obstructed by the shoal areas which extend out from the headlands, as well as by shoals within the 30-foot depth (FIGURE IV - 216). Balete Bay itself is narrow, but has a minimum channel width of about 600 feet near its entrance. The bottom materials are mainly coral mud, with some rocky areas. The beaches are all sheltered from heavy swell, but the small bights along Lacutan Cove may experience choppy seas during the northeast monsoon. The average

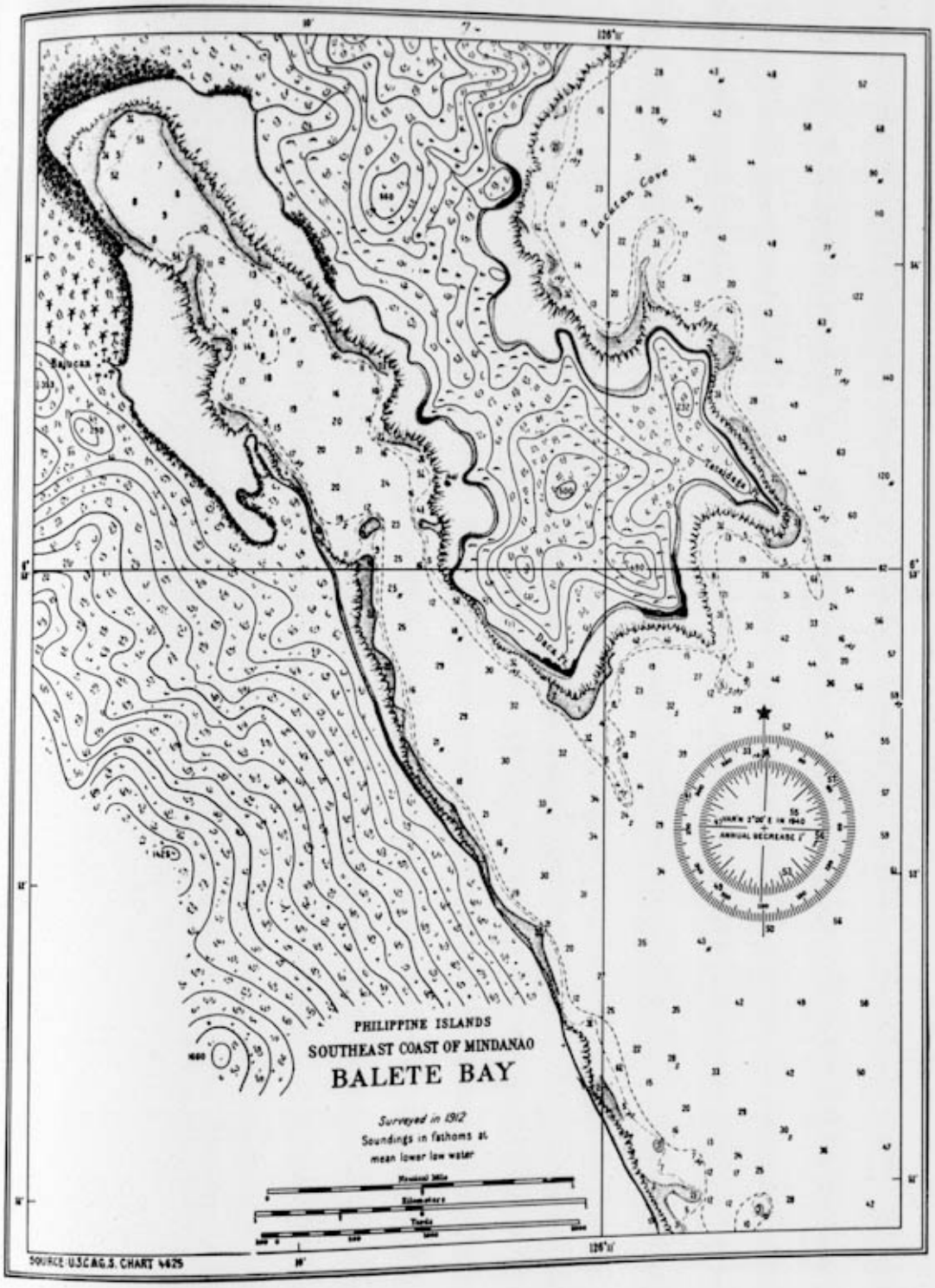


FIGURE IV - 225. *Davao Gulf area, Pujada Bay.*
Chart of Balete Bay, NW offshoot of Pujada Bay.

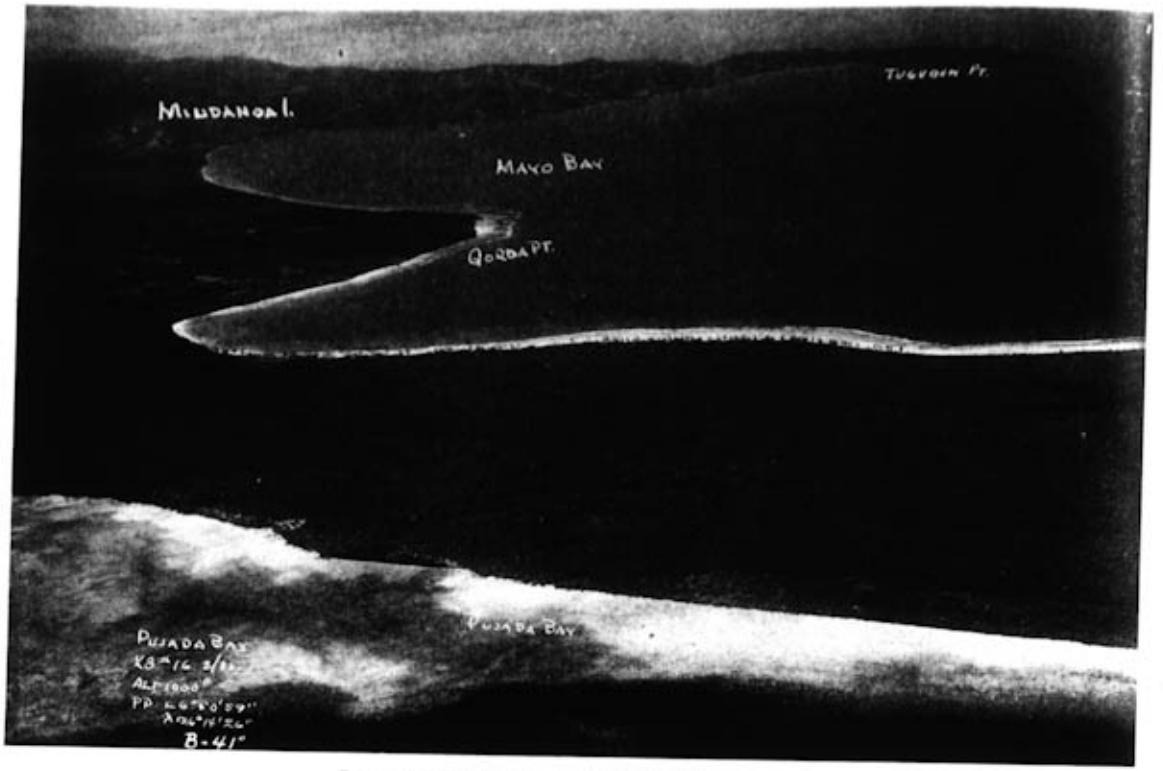


FIGURE IV - 226. *Davao Gulf area, Pujada and Mayo Bays.*
Looking northeastward across the low isthmus of Guanguan Peninsula toward Mayo Bay and its beaches. 1935.

range of the tide is about 4 feet, and the flood tide moves generally northwestward into the cove and bay.

The beaches are composed of coral sand and are crescent shaped, with the widest portions at the center (FIGURE IV - 215). The beaches are firm and have slopes of about 1 on 8 to 1 on 30, with the steepest portions near the ends. There are no structures. Surf is least intense in Balete Bay.

The terrain of the promontory is hilly and rugged, with a dense wooded cover. Locally the lower slopes are laid out in coconut plantations. No trails are known along the promontory itself, but the main coastal road and trail run about a mile inland from the head of Balete Bay. The bay head itself is lined with mangrove.

(*i*) *Mati beach.* (PLAN 30, Section H(i)) Reliability GOOD.

1. Location and extent. An interrupted beach area about 3½ miles long extends westward from the town of Mati at the head of Pujada Bay nearly to Cabayan Point. The limits of this beach area lie at 6° 55′ 50″ N, 126° 11′ 10″ E, and 6° 57′ 00″ N, 126° 13′ 25″ E. The town of Mati may be recognized by its concrete wharf. A light was formerly displayed from a white concrete tower.

2. Nearshore. The approach to the landing area from outside Pujada Bay is obstructed by Pujada Island with its offlying reef islands as well as by Uanivan Island, which lies about 1 mile west of Taganilao Point near the eastern entrance to the bay. From within the bay itself the approach to the beach is clear to the 30-foot depth, except for a shoal which lies about ½ mile east of Camansi Point. A fringing coral reef lines the entire shore in front of the beach (FIGURE IV - 219). It attains a maximum width of 1,600 feet northeast of Camansi Point, but narrows to 300 feet in front of the town of Mati, at which 2 interruptions in the reef also occur. The bottom slope within the 30-foot depth is moderate to the fringing reef. The bottom material along this shore is mainly coral mud and sand, with some rocky patches. The beach is relatively sheltered, although swell from the south may penetrate to the head of the bay. The mean range of the tide is 4 feet at Mati. The flood tidal current moves into the bay toward its head.

3. Character of beach. The beach is interrupted along its western portion by a rocky area at Camansi Point as well as by short stretches of mangrove both north and south of the point. In addition, 2 small streams flow across the beach at the town of Mati. The entire beach is composed of coral sand, and although the westernmost portion is narrow, the entire part of the beach for 2 miles west of Mati is about 200 feet wide at low water. The beach narrows in front of the town and eastward of town it merges with an area of mangrove that lines the inner edge of the fringing reef. The general nature of the beach southwest of Camansi Point and in the vicinity of Mati is shown in FIGURES IV - 218 and IV - 219. The beach is generally firm along its entire extent, and its average slope near the high water line is about 1 on 8. The only structure is the concrete wharf at Mati, about 300 feet long, which extends to the outer edge of the fringing reef (FIGURE IV - 219). Surf is generally light along the beach. Shore drift is variable, but tends toward the center

from both ends of the beach. Favorable landing sites are at the village where the reef is narrowest, as well as at 2 reef interruptions which lie between 6,000 and 7,000 feet west of the western edge of the town.

4. Adjacent terrain and exits. The beach area is backed by a narrow coastal plain which leads to a hilly interior on the west, but the plain widens eastward of the area to merge with the broad coastal plain behind Mayo Bay. The shore of the beach area is mostly lined with coconut palms, although short stretches of mangrove occur near the western end. The plain behind the beach is partly laid out in hemp fields, but the interior hills are generally densely wooded. A road runs eastward from the town of Mati to the settlement of Mayo near the northern end of Mayo Bay. This road also runs westward of Mati, where it joins a cross-country trail leading to Cuabo on the east shore of Davao Gulf. Two trails run northward from Mati and ascend the valley of the Bitanagan River. There is a radio station in Mati. The local water supply depends on wells and cisterns.

(*j*) *Babiasan beach.* (PLAN 30, Section H(j)) Reliability FAIR. A coral-sand beach 6 miles long lines much of the eastern shore of Pujada Bay. The northern limit of the beach lies at 6° 55′ 20″ N, 126° 15′ 55″ E, the southern limit at 6° 50′ 30″ N, 126° 17′ 25″ E.

The approach to the beach is clear except for Pujada Island and Uanivan Island with its associated reefs, which lie off Taganilao Point. A wide fringing coral reef fronts all the main beach, but this reef narrows considerably at Licoc Point (FIGURES IV - 219 and IV - 226). The nearshore bottom slopes are fairly steep to the fringing reef. The bottom materials are coral sand and mud with some rocky areas. The beach is well sheltered from winds and waves of both monsoons. The mean tidal range is about 4 feet and the flood tide moves into the bay.

The beach is composed mainly of coral sand and is generally about 50 feet wide at low tide. It is firm, with a slope of about 1 on 8. No structures are known to occur along the beach. Surf is generally light and the shore drift is variable.

The beach is backed by lowland, generally wooded along the shore, and with cultivated or cleared areas in the interior (FIGURE IV - 226). Near the southern end of the beach and at Babiasan are coconut plantations. The central part of the beach is locally backed by a bank or bluff, and a swampy inlet occurs at the northern end. A trail leaves the beach at the settlement of Tumacob and runs across the peninsula to Bobon.

(*k*) *Lamigan Point beaches.* (PLAN 30, Section H(k)) Reliability FAIR. Several narrow coral-sand beaches lie along the shores southward and eastward from Batiano Point to Lamigan Point and for a distance of 1½ miles north of Lamigan Point. The beach areas lie between 6° 50′ 20″ N, 126° 17′ 15″ E, around the end of the promontory to 6° 49′ 45″ N, 126° 20′ 40″ E. The most extensive beach extends for about 2 miles on both sides of the village of Tanganilao. Lamigan Point serves as a landmark for the area; it is a sheer cliff backed by a hill 1,825 feet high.

The offshore approach to the beaches is clear except for Uanivan Island and its associated reef which lies about a mile southwest of Batiano Point. Within the 30-foot depth the bottom slopes are moderate to the fringing coral reef which lines all this shore. The reef has a maximum width of 2,000 feet at the village of Taganilao. The steepest slopes occur along a stretch for about a mile south of Batiano Point. The southern part of the promontory is exposed to swell from the south, and the eastern portion is exposed to winds and swell from the northeast, but the western part is relatively sheltered. The mean range of the tide is about 4 feet, and the flood tidal current moves westward past Lamigan Point, swinging northwestward into Pujada Bay.

All the beaches are composed of coral sand. They are firm and have slopes averaging about 1 on 8. The beaches are generally relatively narrow above the high water line, but may extend at least 100 feet seaward of that line across the fringing reef at low tide. The Taganilao beach is widest, and although it is fronted by the widest portion of the reef, a shallow channel leads essentially to the village (FIGURES IV - 222 and IV - 223). No structures are known along any of these beaches. Shore drift is variable but is predominantly westward along the beach at Taganilao. Surf varies in intensity and is least serious along the beaches in the western part of the area.

The promontory as a whole is hilly and densely wooded, but a narrow strip of lowland extends on both sides of Taganilao village, and stream valleys back some of the other beaches. The nature of the terrain is shown in FIGURES IV - 221 to IV - 223. Coconut plantations and fields extend along the shore at Taganilao. No trails are known along the promontory.

(*l*) *Mayo Bay beaches.* (PLAN 30, Section H(l)) Reliability GOOD.

1. Location and extent. The shores of Mayo Bay from Bobon Point on the south to Tugubun Point on the north have several extensive beaches. The head of the bay from Bobon Point generally northward as far as Tacaquinay Point is lined with a nearly continuous beach 16 miles long, and in addition there are 3 less extensive beaches averaging about 1½ miles long, along the northern shore of the bay. The long beach around the bay head begins at 6° 51′ 20″ N, 126° 20′ 40″ E, and ends at 7° 00′ 10″ N, 126° 21′ 30″ E. The centers of the 3 smaller beaches are respectively at 7° 00′ 00″ N, 126° 24′ 20″ E; 7° 00′ 10″ N, 126° 26′ 20″ E; and 6° 59′ 40″ N, 126° 27′ 00″ E. Landmarks include Lamigan Point at the southern limit of the bay, with a cliff 108 feet high, and Tugubun Point at the northeastern limit, with a low coral cliff.

2. Nearshore. The offshore approach to the bay shore is clear to the 30-foot depth except for a patch of coral reef which lies about ½ mile offshore at Flaca Point along the northern shore. Within the 30-foot depth the bottom slopes generally rise steeply to the fringing coral reef which lines much of the shore. This reef is very narrow south of Bobon Point, but widens to a maximum of about 1,000 feet about 2 miles northwest of the point. The reef continues about 500 feet wide to Gorda Point, where it is interrupted for a distance of 5 miles northward. The reef resumes about 2 miles northwest of Tacaquinay Point, and continues as a narrow strip along the entire northern shore of the bay. Along the part of the shore not fronted by the fringing reef, the 30-foot depth lies less than 500 feet from the high water shoreline. The bottom material is sand and mud, largely of coral origin. The bay is exposed to the east and south, but the northern half is relatively sheltered from winds and waves during the northeast monsoon. The mean range of the tide is 4 feet. The flood tidal current moves westward along the northern shore of the bay and swings southward past Lamigan Point, although there is some likelihood that counter currents may occur. Tide rips are encountered near the entrance points of the bay. Offshore, east of this area, there is a general southerly drift current.

3. Character of the beach. The most favorable beach in this area is apparently the stretch extending from Gorda Point

northward to the village of Tagabaquid. However, the entire bay is favorable in terms of approach, terrain, and communications, and hence is described in this single section (FIGURES IV - 223, IV - 224, and IV - 226). The beaches that line the bay vary considerably in composition and size of material. The beach from Bobon Point to Gorda Point is of coral origin, and consists of coral sand in its southern part, grading to sand and coral fragments in its central portion, diminishing again to sand size west of Gorda Point. The beach from Gorda Point to Tagabaquid is coarse non-coral gravel, locally as large as cobblestones. The 3 beaches along the northern shore are composed of coral sand and fragments and the beach which fronts the village of Lucatan has the coarsest composition. All the beaches are firm and have steep slopes, but the coarsest portions of the beaches may be more difficult to cross on foot. The beaches are generally narrow above the high tide line, but the gravel beach north of Gorda Point is about 200 feet wide at low tide.

No structures are known to occur along any of the beaches. Surf varies in intensity with the seasons and with position along the bay shore. The heaviest surf probably occurs along the beach between Bobon Point and Gorda Point during the northeast monsoon. Shore drift also varies, but along the beach north of Gorda Point it is predominantly southward.

4. Terrain inland and adjacent to beach. The terrain behind the beaches along the north shore of the bay is steep and rugged, although a trail follows close along the shore past the settlement of Lucatan westward to Tagabaquid, where it joins a road leading to Mayo. This trail is apparently readily accessible from the beaches along the north shore. Near the settlement of Mayo the hills recede from the coast and a broad plain opens out northwestward, with an extension southeastward to the hilly end of the promontory at Lamigan Point. The plain is heavily wooded except near the shore where some areas of coconut are found, as well as cultivated fields. The settlement of Mayo is connected by a road which runs southwestward across the plain to Mati on Pujada Bay. The northern part of this road near the settlement is accessible from the beach. A shore trail runs close behind the beach between Bobon Point nearly to beyond Gorda Point, from which apparently it swings inland to join the road between Mayo and Mati.

(m) Tugubun Point—Casauman Point beaches. (PLAN 30, Section H (m)) Reliability GOOD. From Tugubun Point northeast to Casauman Point, a distance of about 15 miles, are a number of beaches averaging about 1½ miles in length. The limits of this beach area lie between 6° 59′ 50″ N, 126° 27′ 30″ E, and 7° 08′ 55″ N, 126° 31′ 50″ E. Tugubun Point itself is a low coral cliff rising to a hill 430 feet high a short distance inland. A number of other points occur along this shore, but none are conspicuous of themselves.

The approach to the area is clear except for a series of shoals extending for about 1 mile offshore 1½ miles southeast of the village of Tarragona. Within the 30-foot depth the bottom slopes are moderate to steep, with this depth lying locally nearly 1,000 feet from shore. The entire area is lined with a narrow fringing coral reef which attains its maximum width of about 800 feet near the village of Tarragona. The bottom material is coral sand and mud. The beach area is exposed to winds and waves from the southeast, but parts of the beaches are relatively sheltered from the northeast. The mean range of the tide is about 4 feet, and the flood tidal current moves southwestward along the shore. Tide rips may be encountered off some of the headlands.

The beaches in the area are composed mainly of coral sand, usually mixed with some coral fragments. Locally they are rocky. In width they vary from relatively narrow strands to a maximum of 150 feet at low tide opposite the village of Jovellar southwest of Yaco Point. The best landings are said to be made at the village of Tarragona, where a break occurs in the reef. In terms of shelter from the northeast, the villages of Holy Cross (Santa Cruz) and San Ignacio are also good. The beaches are all firm and have slopes averaging about 1 on 10. No structures are known along any of the beaches. During the northeast monsoon, surf may be heavy along portions of the beaches exposed to the east. Shore drift is variable, but a southward trend apparently predominates.

The coast along the beach area is generally rugged, but the beaches lie at the heads of bights which are backed in part at least by coastal plains or river plains. The hilly portions of the terrain are densely wooded, but there is a fringe of coconut palms behind the beaches, and parts of the plains are laid out in cultivated fields. The entire stretch of shore is closely paralleled by a trail which connects the several beaches and continues westward around Tugubun Point to join ultimately with the road at Mayo. A trail runs inland from Holy Cross (Santa Cruz), joining a system of trails that traverses the country to the northwest.

44. *Sulu Archipelago and Basilan Island*

A. Basilan Island.

(PLAN 33)

(1) Offshore zone.

Basilan Strait, which separates Basilan Island from Mindanao is 10 miles wide and affords direct, clear approach to Basilan Island. Large vessels can navigate with safety along the southwest and south coast of Basilan by keeping 1 mile off the coast. Bihintinusa Channel is protected from heavy seas, but the strong current which flows through the channel makes anchorage precarious.

(2) Coastal topography.

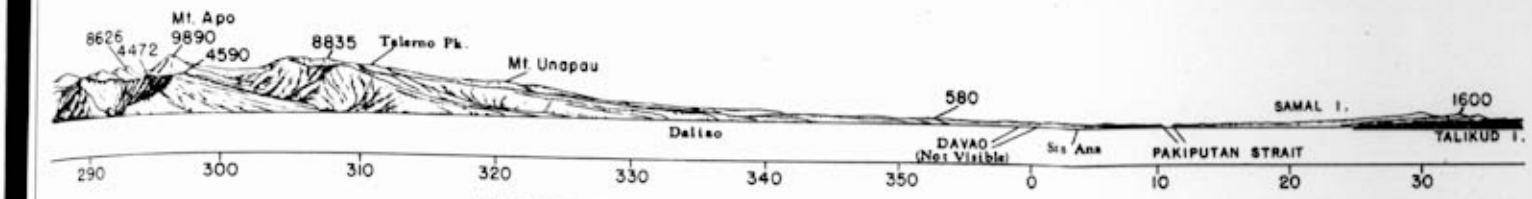
Basilan Island is 32 miles long east—west and 20 miles wide. The greater part of the island is mountainous and heavily wooded. The highest peak, Mount Basilan, 3,317 feet, lies somewhat southward of the center of the island. Many of the higher mountains are frequently covered by clouds. The shores are bordered in many places by a low belt of sand and coral debris on which mangrove swamps have formed. There are no large rivers and no good watering places.

Isabela Channel is a deep strait separating Malamaui Island from Basilan Island. It is mangrove lined except for sand spits at each end, small openings at Isabela beach and at the constabulary landing opposite it. The sides of the channel are coral, almost vertical, with mangrove growing nearly to the edge.

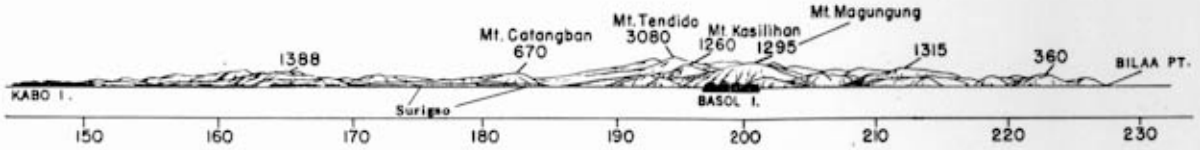
Malamaui Island, 370 feet high, lies off the northwest coast of Basilan Island. All the available land is under cultivation, mainly planted to coconuts. The valuable timber for which the island was noted has been cleared off.

From Isabela the coast stretches 10 miles southwestward to Basilan Point; it is indented at 2 places, by San Rafael Bay and by an unnamed bay south of Lampinigan Island.

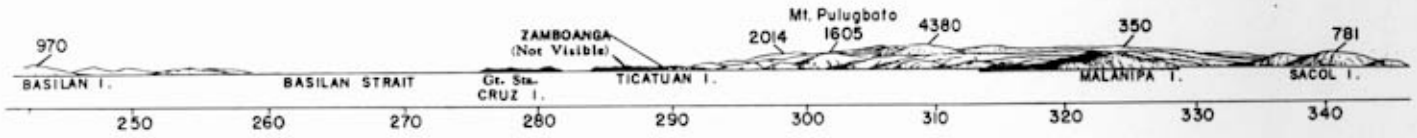
Basilan Point and the shore southward are heavily wooded. A



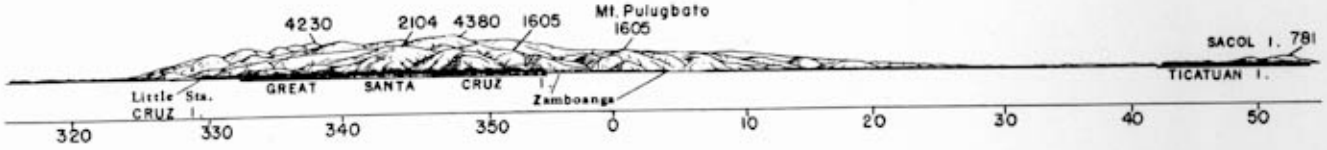
(1) DAVAO, FROM 15 NAUTICAL MILES SOUTH



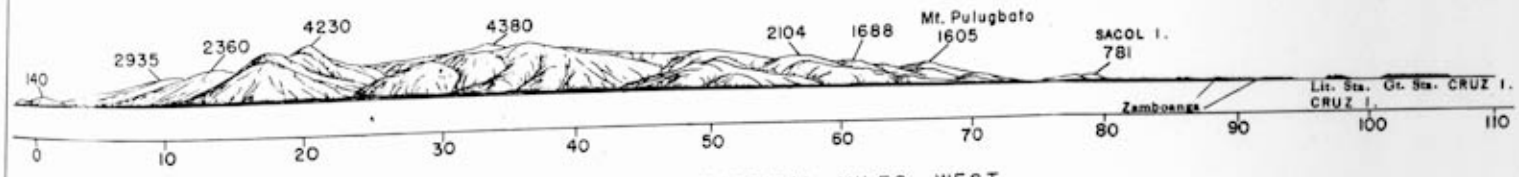
(2) SURIGAO, FROM 5 NAUTICAL MILES NORTH



(3) ZAMBOANGA, FROM 15 NAUTICAL MILES E.S.E.

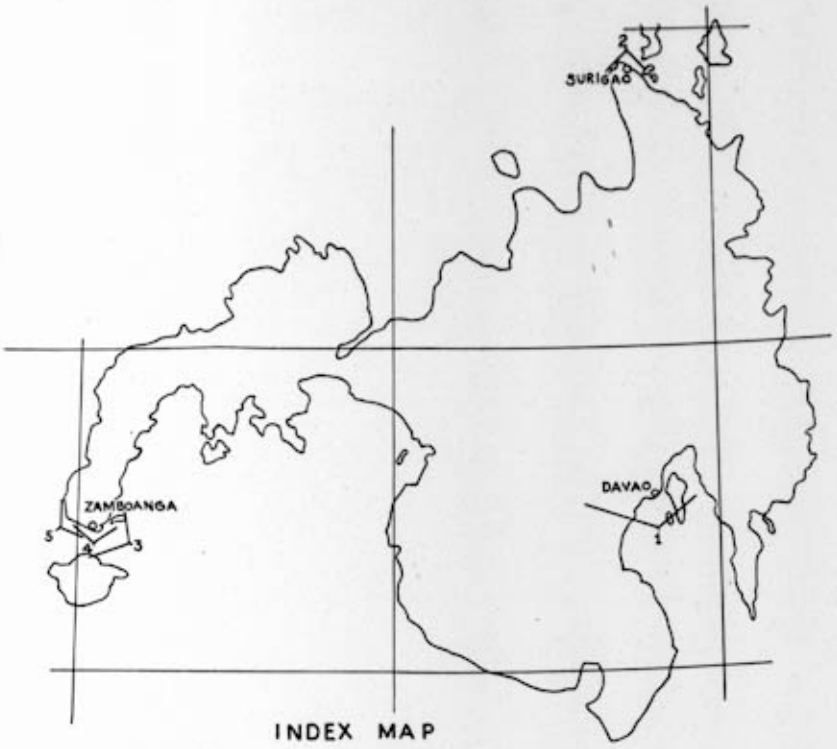


(4) ZAMBOANGA, FROM 5 NAUTICAL MILES SOUTH



(5) ZAMBOANGA, FROM 10 NAUTICAL MILES WEST

FIGURE IV - 227. *Mindanao Island, coastal views.*



PERSPECTIVE VIEWS PROJECTED FROM TOPOGRAPHY ON U. S. COAST AND GEODETIC SURVEY CHARTS BY A MACHINE THAT GIVES TRUE PERSPECTIVE AND CORRECTS FOR CURVATURE OF THE EARTH AND REFRACTION. DETAILS ADDED FROM AVAILABLE PHOTOGRAPHS. VIEWED FROM SEA LEVEL FROM POINTS INDICATED ON ACCOMPANYING INDEX MAPS. VERTICAL SCALE NOT EXAGGERATED. ALTITUDES IN FEET ABOVE SEA LEVEL.

DRAWN BY U. S. GEOLOGICAL SURVEY

PERSPECTIVE VIEWS, MINDANAO

narrow fringe of coral and sand is backed by a wide strip of mangrove swamp in some places. Bagbagan River may be entered by small boats, but it is blocked by fallen trees about ½ mile from the entrance.

Pangasahan Channel is deep but narrow and crooked. It is fringed with mangrove; the small streams that empty into it are closed to navigation by obstructions at their mouths. A logging camp is located along the shore 2 miles southeastward of this channel.

Maluso Bay, open to the westward, has shores consisting of a narrow ridge of sand and broken coral, back of which are the usual mangrove swamps. There is a small island in the northern part of Maluso Bay.

The Canabungan River, emptying into the northern part of the bay, is wide but shoal and can be entered only by small native dugout canoes called *bancas*. The Maluso River is used by a large number of *bancas* and *vintas*, which resemble *bancas* but are larger. The Maluso is kept clear of fallen trees and logs.

Great Gounan and Little Gounan Islands have been partly cleared; Great Gounan is under cultivation.

Kapisahan Island is a small mangrove island in a cove ½ mile southward of Port Holland.

The coast of Basilan Island from Port Holland southeastward to Mangal Point is broken by many small inlets, into which flow numerous rivers. The shore is fringed with a narrow coral reef for about 2 miles, after which mangrove swamps appear continuously down the coast to Mangal Point. The mangroves are backed by heavily wooded slopes which culminate in Abongabong Peak, 2,991 feet in height.

There are several small islands westward of Maluso Bay. Goreno and Takela are covered with mangrove; Tengolan, Pandak, Langas, and Dalauan are lightly wooded; Sicagot, Kaluitan, and Sibakel are heavily wooded.

Tamuk Island, about 1 mile in diameter and 245 feet high, is heavily wooded. A tall tree on the summit of the island forms a good landmark for this vicinity.

Cancuman Island, a small clean islet lying about 1½ miles eastward of the south end of Tamuk Island, is planted to hemp and coconuts. There is a lone prominent tree on the island.

Canas Island and Lahatlahat Island are 2 small mangrove islands separated from the shore of Basilan by deep but narrow channels.

Mangal Point is a heavily wooded strip of sand about 10 feet above high water and lies along the outer edge of the mangrove swamp. There are similar stretches of beach to the eastward of this point, most of them being only 10 to 15 yards wide. The Mangal River has depths of 1 and 2 fathoms inside the bar and is navigable for small boats drawing not over 3 feet for about 1 mile. The best channel across the bar is near the west side. Mangrove extends about ⅓ mile from the entrance, beyond which there is a steep, wooded cliff of about 200 feet.

Bihintinusa Island is separated from Basilan by the deep, clear, ¾ mile Bihintinusa Channel. The island is low and surrounded by coral reef.

Tumajubun Point, 6° 25′ N, 122° 04′ E, is clear, steep, and makes an excellent landmark for ships in the vicinity. From this point northeastward to Kauluan Channel, the coastline is comparatively unbroken. There are several landing places which are separated by short stretches of coral reef.

Kauluan Channel has a general north—south direction; it leads from deep water southward of Kauluan Island to an anchorage eastward of the Takippamasilaan Reefs. The channel is bordered by coral reefs, the projecting points in some places leaving a channel width of only 100 yards.

Kauluan Island is mostly mangrove swamp on a coral reef that bares at low water. Takippamasilaan Island is a narrow ridge of sand and coral boulders near the outer edge of the reef. The greater part of the reef itself is covered at all stages of the tide.

Bohelebung Channel is a deep east—west channel leading from seaward into the shore a little to the south of Bohelebung, the largest and most important town on the east coast of Basilan. Several sand cays lying on the reefs both north and south of the channel are always above water.

Takut Tangug Bay is the large open bay between Kauluan Island and Matanal Point.

The coast from Ugbung northeastward to Kandiis is fringed with a coral reef broken only by the Bohelebung River. Heavily wooded slopes back of this reef ascend to a wooded summit of 1,569 feet which is due west of Dangkalan. Mount Cobung, a cone-shaped peak northeast of this summit, is 2,000 feet high and constitutes a good landmark in this vicinity. Other prominent wooded peaks are Mount Sining Capan, 1,828 feet, and Mount Matanal, 2,066 feet in height.

The northern coast of Basilan from Matanal Point to Isabela Channel is a succession of mangrove, sand, and broken coral beaches. It is highly irregular but in general trends west-northwestward.

(3) Anchorages.

(a) Isabela Channel. The best anchorage in Isabela Channel is westward of the wharf at Isabela in 6 to 9 fathoms; it has coral and sand bottom. There is an excellent anchorage in the channel north of Kalut Island. There is not much swinging room, but larger vessels can be made secure by running lines to the mangroves on shore.

(b) Malamaui Road. Southwestward of the island of Malamaui is a safe anchorage for vessels of all sizes. It is particularly convenient if they make Port Isabela after nightfall when the entrance into the channel would be dangerous. The holding ground is good, and strong winds are rare. The best anchorage will be found southwestward of the shoal in the vicinity of San Rafael Bay; small vessels can lie close in eastward of Balatanai Island.

Abreast the streams at Malamaui Road there is usually sufficient depth over the coral reef at high water to permit entrance of a ship's boat. It is advisable to make landings there, as there is frequently enough surf to damage a boat attempting to land along the shore at other places.

Currents along the face of the dock lag about ½ hour behind the tides. These currents have a maximum strength of 2 to 3 knots, strongest on the ebb which sets southwestward against the face of the dock. On the flood the tidal current sets northeastward and off the wharf face.

(c) Lampinigan Island. The island of Lampinigan may be approached safely; good anchorage may be had to the southward. From its vicinity Balatanai Island can usually be made out.

(d) Pangasahan Channel. The Pangasahan Channel affords good shelter to small boats.

(e) Maluso Bay. The Bay of Maluso is open to westward, but affords anchorage out of the strong tidal currents that sweep through the channels of the Sulu Archipelago.

(*f*) *Port Holland* (FIGURE IV - 228). Port Holland affords well-sheltered anchorage for small vessels. Large vessels may moor to the wharves. (Anchorage while loading logs was had off the cove which is ½ mile southward of Port Holland with the west tangent of Great Gounan bearing north.)

(*g*) *Amoyloi Anchorage* (FIGURE IV - 229). The Amoyloi Anchorage is southward of the town in 15 to 20 fathoms fine sand bottom, and affords good anchorage protected from southerly swells.

(*h*) *Kauluan Channel.* The anchorage in the Kauluan Channel is in 12 to 15 fathoms sand bottom. The best approach, however, both as to depth and width of channel is from the north through the Bojelebung Channel. There are several other channels through the reefs, but they are narrow, tortuous, and in many cases blocked by fish traps.

(*i*) *Bohelebung Channel.* The anchorage at Bohelebung Channel is off the town of Bohelebung in 16 to 17 fathoms, coral bottom. Swinging room is limited in this anchorage.

(*j*) *Takut Tangug Bay.* Anchorage may be found in the northwestern section of Takut Tangug Bay. This anchorage is partly protected by the Takut Tangug Shoals which extend to within 1 mile of the Kandiis River.

(*k*) *Kandiis River.* Small vessels can find better-protected anchorage in the mouth of the Kandiis River in about 2 fathoms, mud bottom.

(4) Dangers to navigation.

(*a*) *Moro Island.* About 300 yards southeast of Moro Island at the south entrance to Isabela Channel, there is an extensive reef awash, nearly always covered by driftwood and well marked by the ripple around the edges; part of the sand is always above water. The depth of water off the eastern edge of the bank is decreasing toward the coast.

At 300 yards westward from Moro Island there is a small shoal covered by 16 feet. The channel on either side of Moro

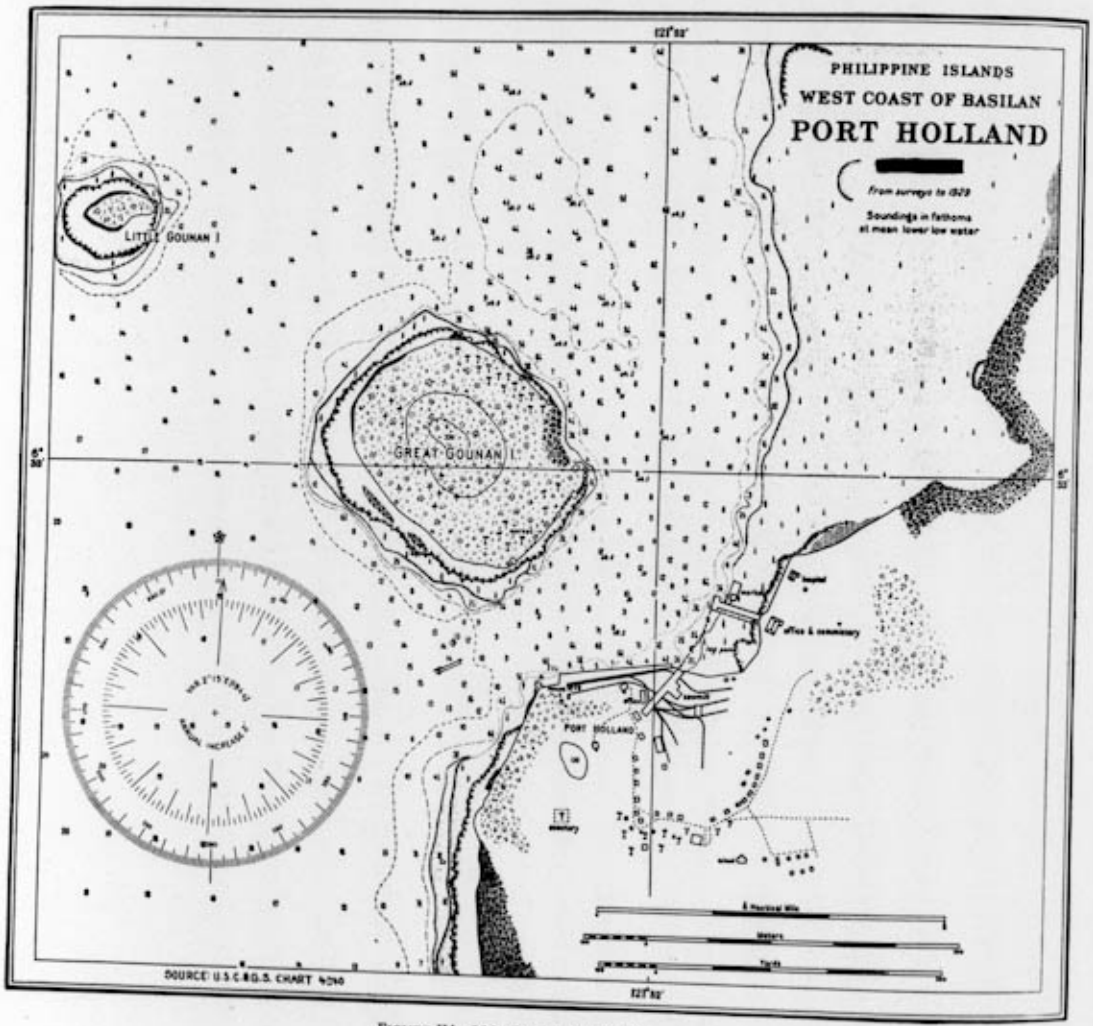


FIGURE IV - 228. *Basilan Island, W coast.*
Port Holland. Section from U.S.C. and G.S. chart 4540.

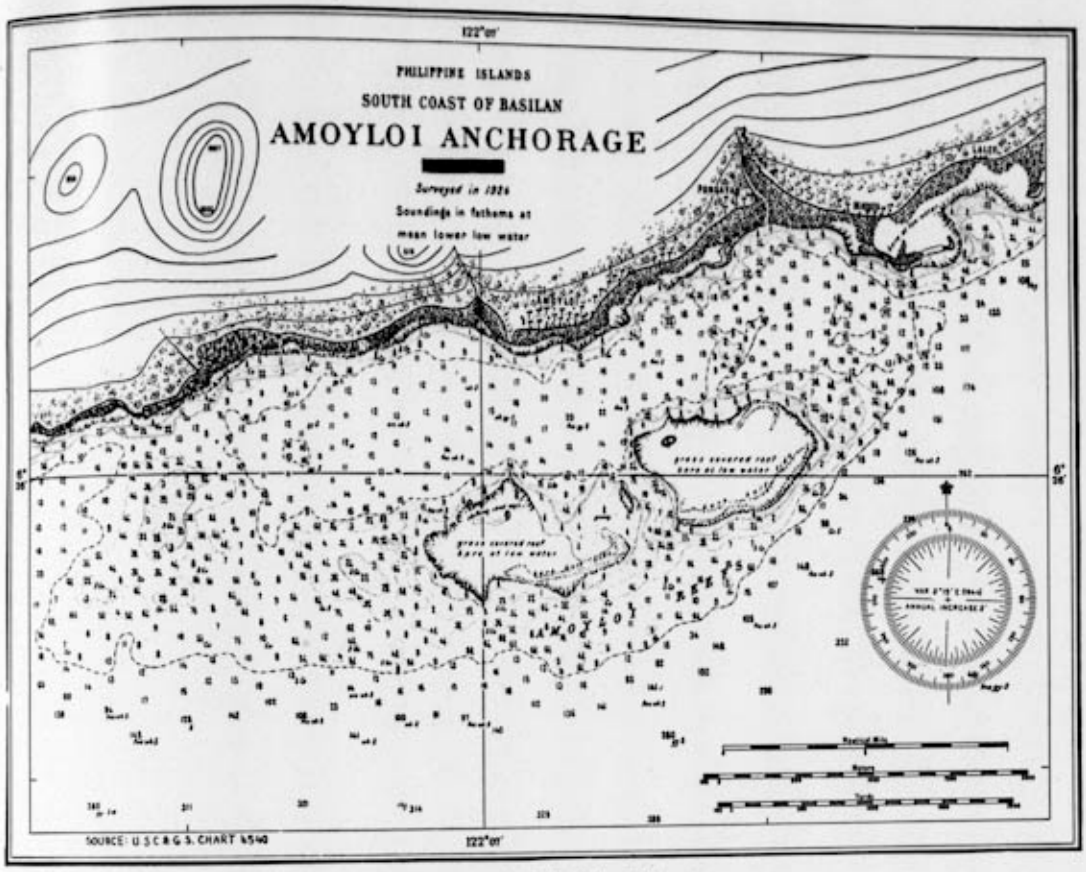


FIGURE IV - 229. *Basilan Island, SE coast.*
Amoyloi Anchorage. Section from U.S.C. & G.S. chart 4540.

Island may be taken, but that on the north of the island and south of Malamaui Island has the greater width and depth of water.

The dangers to be avoided in navigating the channel are a ¼-fathom shoal on the south side of the eastern entrance; a ¾-fathom shoal lying ½ mile northeast of Isabela; the shoal southeast of Moro Island which bares at low water; the shoals westward of Moro Island; and the reef that extends southwest of the western end of Malamaui Island.

(*b*) *Pamelukan Bank.* Situated about 2 miles westward from the west side of Malamaui Island is Pamelukan Bank. From the position where the least water, ¾ fathom, is found, the highest part of Lampinigan Island bears 227° true and Moro Island 103° true. The remainder of the bank has 5 to 10 fathoms of water over it.

There is a long shoal westward from Pamelukan Bank, stretching east—west for 4 miles, which has 2 patches of 3¾ fathoms on it, lying, respectively, 1¾ miles 347° true and 2 miles 30° true from the summit of Lampinigan Island. Besides these shoals there are several banks northwest of Malamaui, on which the least depth found was 6 to 8 fathoms. Strong and irregular currents and tide rips are found in the vicinity of all these shoals.

A coral shoal with 13 feet over it lies 1¼ miles 238° true from Moro Island.

(*c*) *Maluso Bay.* The chart shows several reefs lying about ¼ mile offshore in Maluso Bay with deep water close to them. About 3 feet of shoal water, with several coral heads awash at low water, extends over ½ mile offshore in Maluso Bay near the Canabungan River.

(*d*) *Great Gounan Island.* There is a shoal of sand with a depth of 3¾ fathoms northeastward of Great Gounan Island, and another with a depth of 4¾ fathoms about ½ mile north of Little Gounan Island. The shoal water extending off the mouth of the Maluso River and the absence of good leading marks makes it hazardous to pass northward and eastward of Great Gounan Island.

(*e*) *Goreno Island.* There is a reef with ¼ fathom least water lying 200 yards off the northeast side of Goreno Island. A 4¾-fathom shoal lies ½ mile northward of the island. The latter shoal lies about ¼ mile westward from the track to Port Holland when approaching from the northward.

(*f*) *Kaluitan Island.* Shoal water extends almost 1 mile southeast of Kaluitan Island and about ½ mile north of Sibakel Island.

(*g*) *Sicagot Island.* The 3-fathom shoal ⅓ mile southeast of Sicagot Island, a 1½-fathom shoal ¼ mile north of Langas Island, and a 4¾-fathom shoal ¼ mile south of Tengolan Island are dangers to be avoided when approaching Port Holland

from the vicinity of Mataja Island. All the shoals are generally marked by swirls and tide rips.

(*h*) *Tamuk Island.* A 4¾-fathom shoal lies 1¼ miles northward of Tamuk Island.

(*i*) *Canas Island.* Canas Shoal, with 2½ fathoms of water over it, lies ½ mile west of Canas Island.

(*j*) *Lahatlahat Island.* A reef with depths of 2½ and 2¼ fathoms extend from ¼ to 1 mile southeastward of Lahatlahat Island.

(*k*) *Bihintinusa Island.* Shoal water extends 1¾ miles eastward of Bihintinusa Island.

(*l*) *Amoyloi Anchorage.* The eastern entrance of Amoyloi Anchorage is almost closed by 2 shoals having 1¼ and 2¾ fathoms of water over them. There is a large shoal area in the western entrance with a least depth of 1½ fathoms. The channel between this shoal and the coast of Basilan is deep, but only about 150 yards wide. Between the shoal in the western entrance and the shoals extending off the Amoyloi Reef there is an effective depth of 5½ fathoms.

(*m*) *Kauluan Channel.* Kauluan Channel carries depths in excess of 10 fathoms after crossing a shoal area at the southern entrance where depths of 3¼ fathoms are found.

(*n*) *Kauluan Island.* Kauluan Island is mostly mangrove swamp on a coral reef. The greater part of the reef itself is covered at all stages of the tide.

(*o*) *Takut Tangug Bay.* The depths over the Takut Tangug Bay Shoals vary from ¼ to 5 fathoms. Inside these shoals is an area of about 3 square miles with depths from 10 to 22 fathoms, bottom coral and sand.

(*p*) *Northeast coast of Basilan.* There are no outlying dangers on the northeast coast of Basilan except in the bay between Calagusang and Batupare Points, where there is a rock awash, and several shoals with depths of 2¾ and 4¼ fathoms. Luzon Reef, lying 2 miles north of Batupare Point in Basilan Strait has a least depth of 3½ fathoms.

(5) Landing beaches.

The Basilan Island beaches discussed below are shown on PLAN 33. Details for Isabela Channel are shown on PLAN 34, for Bohelebang and Kauluan Channels, on PLAN 35.

(*a*) *Isabela beaches.* (PLAN 33, Section A(a); FIGURE IV - 230) Reliability FAIR. A small-boat harbor and several short coral-sand beaches are located at Isabela and along the north coast of Basilan Island for a distance of 2½ miles southwest of the town. The limits of the area concerned lie between 5° 42′ 30″ N, 121° 58′ 20″ E, and 5° 41′ 30″ N, 121° 56′ 30″ E. Malamaui Island, with a hill 370 feet high, lies a short distance offshore from this landing area. The approach to the area is obstructed by the island and by Pamelukan Bank west of it, as well as by Moro Island and a reef in the channel between Malamaui Island and the beaches. Near shore the bottom slopes vary from gentle to steep. A fringing coral reef of variable width fronts the western half of the area. The bottom material is mainly coral sand and mud. The beach area is largely sheltered by the off-lying island, although the western part is exposed to winds and waves from the northwest. The mean tidal range is about 2 feet, and the flood tidal current moves westward along the shore, developing tide rips near the mouth of the channel between Malamaui Island and the main shore. The beaches are all small, not exceeding several hundred feet in length, and they occur between areas of mangrove. The easternmost beach, just west of Isabela, is lined with houses which extend out over the water. Across the inlet just east of this beach is the settlement of Isabela with harbor structures as shown on PLAN 34.

All of the beaches are composed of coral sand and have slopes of about 1 on 8. They are narrow above the high water line and are generally firm. No structures other than those mentioned are

FIGURE IV - 230. *Basilan Island, NW coast.*
Isabela. Houses built over water and obstructing approach to beach. Looking SW. 1940.

present. Surf is generally light and shore drift is variable. The beach area is backed by a plain, cultivated with coconut palms along the beach margin and becoming wooded inland. There are extensive mangrove areas between the beach areas and east of Isabela. A road runs eastward from Isabela to Lamitan, and a number of trails lead southwestward connecting with the western shore of the island.

(*b*) *San Rafael Bay beach.* (PLAN 33, Section A(b)) Reliability FAIR. The head of San Rafael Bay is lined with a sand beach which continues interruptedly along its eastern shore. The beach as a whole is about 2 miles long, and its limits lie at 5° 41′ 30″ N, 121° 56′ 20″ E, and 5° 40′ 20″ N, 121° 55′ 40″ E. The offshore approach to this beach is clear and, within the 30-foot depth which itself lies outside the bay limits, the bottom slopes are nearly flat, shoal water extending 2,000 feet from shore. A fringing coral reef, averaging about 200 feet wide, fronts much of the beach along the eastern shore of the bay. The bottom material is mainly soft sand, partly of coral origin. The bay is open to the north, but is partially sheltered from winds and waves from the northeast. The mean range of the tide is about 2 feet and the flood tidal current moves southwestward outside the bay. The beach is composed of sand which, along the eastern part of the beach, is mainly of coral origin. The beach is generally narrow above the high water line. Along the coral reef it is firm and has a slope of about 1 on 8. Along the head of the bay the beach is generally firm, with local soft areas where the beach is interrupted by 2 river mouths, one located near the southeastern corner of the bay, and the other at about the center of the bayhead. In this stretch the beach slope is probably about 1 on 20. A small area of mangrove interrupts the eastern part of the beach. At the western end the beach terminates in a sand spit at the mouth of the Gumalarang River. There are no structures along the beach. Surf is generally light and shore drift predominates to the southwest along the head of the bay. A river plain runs inland for some distance behind the head of the bay, but behind the eastern part of the beach the terrain rises to hills about 500 feet high within ¾ mile of the shore. In general these hills and the lower slopes behind the plain are heavily wooded. Directly behind the beach, along the head of the bay, are groves of coconut palms. The village of Baaba lies in the center of this area and from it exits are provided along trails which lead northeast and southwest along the coast from Baaba and inland across the island to the south and east coasts.

(*c*) *Atonaton River—Basilan Point beach.* (PLAN 33, Section A(c); FIGURES IV - 231 and IV - 232) Reliability FAIR. From a spot about 1½ miles east of the Atonaton River to a position 1 mile westward of Basilan Point, the coast is lined with an extensive sand beach which is interrupted by short stretches of mangrove. The limits of the area lie at 6° 40′ 30″ N, 121° 55′ 20″ E, and 6° 40′ 50″ N, 121° 49′ 50″ E. The offshore approach is obstructed by 2 small islands which lie within 2 miles of the shore. The 30-foot depth line lies about 1,500 feet from the shore in the eastern part of the area, but departs more widely opposite the village of Matican. Some shoal areas lie within this depth and a narrow, fringing coral reef skirts the shore in places. The bottom material is mainly sand, largely of coral origin. The beach is exposed to the north, and the western portion is subject to winds and swell during the northeast monsoon. The mean range of the tide is about 2 feet, and the flood tidal current moves westward along the shore. The beach is composed of sand, mainly of coral origin. It is firm and has a slope averaging about 1 on 8 near the high water line. The beach varies considerably in width at low tide, attaining a maximum of about 300 feet. At high tide the beach is almost everywhere narrow. Locally, about 1,500 feet west of the Atonaton River mouth is a cluster of boulders. No structures occur along this beach. Surf is probably heaviest along the western part of the beach. The terrain inland of the beach is low and flat, with a fringe of coconut palms along the shore and scattered areas of mangrove between the sections of the beach. Locally a low bank may be present near the high water line at the inner edge of the beach. A trail parallels the shore from Baaba westward to Matican and continues southwestward to the western shore of the island. This trail is accessible from the eastern portion of the beach, but no trails are shown leading from Basilan Point.

(*d*) *Port Holland beach.* (PLAN 33, Section A(d); FIGURES IV - 233 and IV - 234) Reliability GOOD. A short sand beach occurs along a short promontory at Port Holland on the western shore of Basilan Island. This beach is located at about 6° 33′ N, 121° 52′ E. In addition, narrow coral strands occur at scattered intervals both north and south of Port Holland. A lumber mill with 5 chimneys is located at the port. The offshore approach to this area is obstructed by several islands lying off Maluso Bay; closer to shore is Great Gounan Island, which lies about 700 feet northwest of the lumber mill dock. Within the 30-foot depth the bottom slopes along the beach proper rise steeply to the coral reef which fronts the beach. The bottom ma-

FIGURE IV - 231. *Basilan Island, NW coast.*
Beach W of Atonaton River mouth, looking NW.

FIGURE IV - 232. *Basilan Island, NW coast.*
Atonaton River mouth. Beach and boulders 500 yards west of river. Looking NE.

terial is mainly coral sand. The area is exposed to winds and waves from the southwest through northwest. The mean range of the tide is about 2 feet and the flood tidal current moves northward along the shore, developing tide rips in the channels among the islands of Maluso Bay. The beach itself is located along the shore of the promontory south of the lumber mill. It is less than ¼ mile long and forms a relatively narrow strand along the inner edge of the fringing coral reef. The beach is composed of coral sand and has an average slope of 1 on 8. It is firm. The scattered strands which extend along the shores of similar promontories adjacent to Port Holland are of like nature and are backed by mangrove. The beach at Port Holland is backed by dense native vegetation, but exit is possible from its northern end to the dock area of the lumber mill. The promontory itself is low and flat, and a trail leads inland to the town of Maluso, where connections are afforded to the northeast and northwest.

(*e*) *South Shore beaches.* (PLAN 33, Section A(e); FIGURE IV - 229) Reliability FAIR. A narrow sand beach lines the shore of Mangal Point and other similar beaches occur at villages along the south shore of Basilan Island almost as far east as Kauluan Channel. The shore is generally fringed with mangrove swamp. The limits of the area lie at 6° 25′ 00″ N, 121° 57′ 00″ E, and 6° 27′ 05″ N, 122° 08′ 55″ E. Tumajubun Point, at about the center of the area, is clear and steep and is a good landmark. The offshore approach to the beaches is obstructed by 2 large shoal areas. One occurs around Bihintinusa Island, which lies about 1½ miles offshore at about the center of the area; the other around Amoyloi Reefs. Nearshore the bottom slopes are generally moderate to gentle to the fringing coral reef which lines much of the shore. The bottom material is mainly coral sand. This area is open to the south and is generally exposed to winds and swell during the southwest monsoon. The mean range of the tide is about 5 feet at Amoyloi near the eastern limit of the area, and the flood tidal current moves westward. Tide rips occur off the Amoyloi Reefs, in Bihintinusa Channel, and south of Mangal Point. The beaches are all composed of sand, mainly of coral origin. They are narrow, probably varying in width from 10 to 30 feet above high water, and have slopes of about 1 on 8. No structures are known to occur along the beaches. Surf may be heavy when waves are running. Shore drift is variable. At Mangal Point the beach is backed by thick woods interspersed with mangrove areas. Small coconut groves line some of the beaches which occur at small villages. The whole area is backed by fairly steep, wooded slopes which rise close back from the shore. A trail, from the northwest, leads through the village of Mangal and along the shore about ½ mile inland as far east as the village of Kabinghing. Here it turns inland to the northeast. No trails are known along the eastern part of the area.

(*f*) *Takut Tangug Bay beaches.* (PLAN 33, Section A(f)) Reliability FAIR. Several beaches lie along the shores of Takut Tangug Bay from Ugbung to Matanal Point. The beaches are all narrow at high tide and vary in length from about 1,000 feet to 1½ miles. The limits of the area lie at 6° 29′ 40″ N, 122° 11′ 40″ E, and 6° 37′ 00″ N, 122° 19′ 20″ E. Mount Cobung, 2,000 feet high, and Mount Matanal, 2,066 feet high, lie about 1½ miles inland from the central and eastern parts of the area respectively. The approach to the shores of the bay is obstructed by a large shoal area extending diagonally across the bay and along the shore to the south, lying from about ½ mile to 1 mile offshore (PLAN 33). Along the northern and eastern parts of the beach area the sea approach is clear to the 30-foot depth; within that depth the bottom slopes are moderate to the fringing reef which lines the shores to a varying width. The area is exposed to the south and east and the southern part of the bay is subject to winds and swell from the northeast during the northeast monsoon. The average range of the tide is about 4½ feet, and the flood tidal current moves generally southwestward along the shore. All of the beaches are composed of coral sand and are relatively narrow. They are firm and have average slopes of 1 on 8. The beach areas are separated by stretches of mangrove or by rocky shore. No structures occur on the beaches. Surf varies in intensity and apparently is heaviest along the western bay shore. The terrain inland rises in moderate to gentle slopes to a hilly interior, generally heavily wooded. Nearshore are coconut palms along the beaches; but at Ugbung, for example, the beach is closely hemmed by mangrove. A trail parallels the shore from Bohelebung past Tambunan, and cuts across the island to Lamitan. No trails are indicated along the northeastern part of the beach area.

FIGURE IV - 233. *Basilan Island, W coast.*
Fort Holland on southeast shore of Maluso Bay. Air view, showing lumber mill. Beach in right foreground. Other narrow strands in right background. Looking SE. 1936.

FIGURE IV - 234. *Basilan Island, W coast.*
Port Holland. Near view of lumber mill and other shore structures. Looking S.

(*g*) *Kulibato Point beaches.* (PLAN 33, Section A(g)) Reliability FAIR. The north shore of Basilan Island from Kulibato Point to the settlement of Semut has several small beaches scattered along it. The limits of this area lie at 6° 40′ 30″ N, 122° 09′ 20″ E, and 6° 39′ 50″ N, 122° 13′ 00″ E. The approach to this part of the coast is clear; within the 30-foot depth the bottom slopes are generally steep to the fringing coral reef which fronts the western half of the area. The bottom material is mainly coral sand. The beaches are exposed to the north and are subject to wind and swell from the northeast during that monsoon. The mean range of the tide is about 3½ feet; the flood tidal current moves westward along the shore. The beaches are composed of coral sand, they are narrow, firm, and have slopes varying between 1 on 6 and 1 on 10. The beach at Kulibato Point has a wharf projecting from it, 50 feet long, extending into water about 20 feet deep. Locally the lower portion of the beach may be rocky. Surf is heavy when swell is running. Shore drift is westward. The terrain in back of the beaches is generally low near the coast, but it rises to hills on the south. A low bank backs part of the beach, and the terrain immediately behind the shore is locally brushy, elsewhere fringed with coconut palms and in places lined with mangrove. The interior is locally cultivated with hemp and rice. A trail runs parallel to the coast from Semut to Kulibato Point, and a road runs from the point to Lamitan. Between Kulibato Point and Semut are other possible landing sites, but detailed information is lacking.

(*h*) *Balas beach.* (PLAN 33, Section A(h)) Reliability FAIR. A narrow, coral-sand beach extends interruptedly northward and westward for a distance of 3½ miles from the village of Balas on the north shore of Basilan Island. The limits of the beach lie at 6° 41′ 20″ N, 122° 08′ 10″ E, and 6° 43′ 20″ N, 122° 06′ 40″ E. The approach to the shore is clear to the 30-foot depth, within which the bottom slopes are moderate to the beach. The bottom material is coral sand. The beach is exposed to northeast winds and swell during the northeast monsoon. The mean range of the tide at Balas is 3.6 feet; the flood tidal current moves northwestward along the shore. The beach is composed of coral sand, interrupted near its central portion by an area of mangrove. The beach is narrow above high tide; it is firm, and has an average slope of 1 on 8. There are no structures along the beach so far as is known. Surf is heavy when swell is running. Shore drift is variable, but tends to be southward along the eastern part of the beach. The terrain back of the beach is wooded plain with a fringe of coconut palms behind most of the beach. No trails are indicated in this area, but travel is possible laterally along the eastern part of the beach to the village of Balas.

(*i*) *Balaktasan River beach.* (PLAN 33, Section A(i)) Reliability FAIR. The north shore of Basilan Island, from a distance of 3½ miles east of the Balaktasan River to a distance of 3 miles west, is an interrupted, narrow sand beach. The limits of the beach lie at 6° 44′ 00″ N, 122° 04′ 40″ E, and 6° 44′ 30″ N, 121° 59′ 50″ E. The approach to the shore is partly obstructed by Luzon Reef, which lies slightly more than 2 miles north of the eastern part of the area. Within the 30-foot depth the bottom slopes are moderate to the beach. Small patches of fringing coral reef skirt the shore. The bottom material is coral sand. The beach is exposed to the north and east and is subject to winds and swell during the northeast monsoon. The mean range of the tide is about 3 feet; the tidal current moves westward on flood, with tide rips near Luzon Reef. The beach is interrupted for about a mile west of the mouth of the Balaktasan River, and this interruption is lined with mangrove. The beach is composed of sand, mainly of coral origin. It is firm and has a slope of about 1 on 8. No structures occur along the beach. Surf is heavy when swell is running. Shore drift apparently runs westward and southward from Batupare Point. The terrain behind the beach is generally low and in part the shore is fringed with coconut palms. Elsewhere it is backed by heavy woods and along the westernmost mile of its extent the shore area is backed by mangrove. A trail or poor road approaches the shore near the mouth of the Balaktasan River, but no detailed information is available regarding trails along most of the beach.

B. Jolo Island.

(PLANS 26, 36, and 37.)

Jolo Island is in the center of the Sulu Archipelago. It lies 45 miles southwest of Basilan Island and 60 miles northeast of Tawitawi Island. Coastal water depths and landing beach conditions are shown in greatest detail on PLAN 36. Space relationship to other islands is shown on PLANS 26 and 37).

(1) Offshore zone.

A least depth of 2½ fathoms is found in the channel leading southwestward to Dalrymple Harbor. This harbor lies between Tulayan Island and the Tandu' Batu beaches in northeastern Jolo Island. The tidal current through this channel attains a maximum of 2½ knots.

The Island of Bancungan, 10 miles northwest of Dalrymple Harbor and ½ mile offshore, is steep-to except for a bare rock lying 380 yards off the northwest corner. The channel between Bancungan Island and Igasan Point has depths of 16 to 18 fathoms.

The channel between Marungas and Pangasinan Islands lies 4 miles northwest of the town of Jolo. It is ½ mile wide with depths of 6 to 12 fathoms. Marungas is the southernmost island of a group which includes Cabucan, Bubuan, Lahatlahat, Tawitawi, Hegad, and Minis Islands. The channels between these islands have deep water but rather strong tidal currents.

Between Tulian Island and Pulaluaac Point, at the western end of Jolo Island, the channel is clear and deep on the Tulian side, but there are depths of only 4¾ fathoms at a distance of nearly ½ mile from the Jolo shore.

Sulade Island is 9 miles southwest of Jolo Island. There is considerable current in the vicinity of Sulade Island; between Sulade Island and Jolo a velocity of 5 knots has been observed. The northwestward strength occurs about 2½ hours after low water at Cebu; the southeastward strength about 1½ hours after high water at Cebu. The slacks precede the times of high and low waters at Cebu by about ¾ of an hour.

In Maimbung Bay on the south coast of Jolo the tides are semidiurnal. Inside of the shoals the current is not noticeable, but in the offing it is strong and irregular. At low tide the offshore water is very shallow.

The channel separating Tambulian and Dongdong Islands has 9 fathoms of water.

The Sulu Archipelago lies on a bank, the edge of which is near the southeast coast of Jolo; tide rips usually are found in the vicinity of the abrupt change in depth. The tidal currents follow the coast and are very strong, currents up to 5 knots being experienced in the narrower channels. The flood sets westward and northward, the ebb eastward and southward.

FIGURE IV - 235. *Jolo Island, N coast.*
Caduayan Beach. Lake Seit in foreground. Mount Dakula at near left. Mount Matandang in left distance. Mounts Bahu, Pang, and Matungkup in center distance. Mount Timpoak and Tuctuc Point at right. Jgasan Point beyond. Looking NW. 1936.

(2) Coastal topography.

Jolo Island, from which the Jolo group derives its name, is about 43 miles long east—west, and 3 to 13 miles broad north—south. The island surface rises to many conical hills and low mountains (FIGURE IV - 235), the highest elevation, 2,664 feet, being on the west end. Most of the land on the hills and mountains is bare of timber. The coasts are in general wooded, clear, and steep-to, as are also the islands and islets that border them. They are slightly indented, forming several bays where there is anchorage.

The north coast of Jolo Island trends northwestward and westward from Tandu' Batu to Jolo. It is fairly regular except for a large indentation at Caduayan. An almost continuous coral reef fringes this coastline with breaks at Caduayan, Mount Timpoak and other brief stretches, opposite sparsely wooded slopes which rise gradually behind the beaches and ascend to several conspicuous peaks, among which Mount Bahu, 2,590 feet, is the highest.

Dalrymple Harbor (PLAN 38), or Port Tulayan, is formed by the coasts of Jolo Island and Tulayan Island, which lies, ¾ of a mile north of Tandu' Batu.

Tulayan Island has a cone-shaped peak, 527 feet high, which makes a good landmark when approaching Jolo from the north and east. Much of the slope has been cleared of timber and is cultivated. The east and south shores of Tulayan are sand beach; the west and north shores are steep and rocky.

Gujangan Island lies 3½ miles northwest of Tulayan Island. The 2 wooded hills, 400 and 265 feet high, are connected by a narrow strip of low land, and when first sighted they have the appearance of separate islands. The island has deep water all around except on the east side, where there is an extensive coral reef that bares at extreme low tide.

Bancungan Island, 6° 05′ N, 121° 10′ E, lying ½ mile east of Igasan Point, Jolo, is triangular in shape, 508 feet high and wooded, except where parts of the southern slopes have been planted to sugarcane, bananas, and coconuts.

Panganaa Island, steep, rocky, and wooded, lies about 1 mile eastward of Bancungan.

At Jolo (FIGURE IV - 236) there is a modern "T"-wharf constructed of stone and rock for the first 400 feet, beyond which there is 80 feet of piling. The "T" section is attached to the piling portion (FIGURES IV - 237 and IV - 238).

From Jolo the coast extending around the western end and along the southern part of Jolo Island to Maimbung is also fringed by a coral reef, broken only between Tubingantan Point and Cabalian Point, a distance of 1 nautical mile. The highest mountain on the island is Mount Tumatangas, 2,664 feet, located in the extreme western part. The coast is backed by wooded slopes with palms and other trees extending to the water's edge. The shores of Maimbung Bay are everywhere lined by a fringing coral reef, and the northern and eastern shores are covered with a heavy mangrove growth.

Tulian Island, situated 8 miles southwest of Jolo town and 1¼ miles off Pulaluaac Point, is 113 feet high, clear, and cultivated.

Parang Island is a small low island ½ mile southeast of Bunga Point and is separated from the Jolo shore by a shallow channel 800 yards wide.

Sulade Island, lying about 8 miles southwest of Bunga Point, Jolo Island, is low and swampy. It consists of a coral and sand ridge surrounding a shallow lagoon.

Maimbung Bay (FIGURE IV - 239), affords good shelter during the northeast monsoon, but is liable to a heavy swell during the southwest monsoon. The bay is about 8 miles wide between Cabalian Point, the western entrance, and Putic Point, the eastern entrance. It extends 3 miles in a northward direction. At the head are the river and town of Maimbung. The shores of the bay are bordered by a narrow coral reef, and a depth of 5 fathoms will generally be found at 400 yards from the shore.

There are 2 good channels into the anchorage off the town of Maimbung. The eastern, between Marban Bank and the eastern shore of the bay, is the better; it is about ½ mile wide and has not less than 5 fathoms in the middle.

Teomabal Island, situated about 3½ miles southwestward of Putic Point, is small, low and surrounded by coral reef which extends about ½ mile from the southeast side. The greater part of Teomabal Island is a large lagoon that nearly bares at low water.

Patian and Lumbian Islands, east of Teomabal Island, are clear and steep-to.

From Putic Point the coast trends northeastward and is lined by a wide coral band backed by wooded slopes. The coral reef is absent for 1 nautical mile at Mabajoc Point, but becomes increasingly wide in Tutu Bay and is backed by wooded slopes.

From Tanun Point to Karangdato Point is a wide coral band broken by a shallow inlet eastward of Tanun Point at Karungdung. Back of the reef at Karangdato Point is a thick mangrove swamp.

Tutu Bay (FIGURES IV - 240 to IV - 242), east of Maimbung Bay, is separated from the bay on the north side of Jolo Island only by a low isthmus 2½ miles wide. A narrow, steep reef skirts the western shore of the bay, but from the northern and northeastern shores, between Tutu and Karangdato Points, the reef extends 1 mile from the coast.

Pata Island is circular, about 4½ miles in diameter, and rises to a height of 1,385 feet near the center. The higher parts of the island are covered with *cogon* grass. The lower slopes are wooded, with some cultivated areas. The island is clear and steep-to outside the shore reef.

Damocan Island is separated from the northwest coast of Pata by a deep, clear channel ½ mile wide. Damocan Island is small, planted to coconuts, and rises to a height of 136 feet to the tops of trees.

Dongdong Island is separated from Pata Island by a deep clear channel more than ½ mile wide (FIGURE IV - 241). The island is low, with barrier reefs outside the mangrove on the north and east. The southwest shore is sand beach. This part of the island is planted to coconuts.

Tambulian Island is a small low circular island northwest of Dongdong Island. It is surrounded by a coral reef which bares at low water. This reef extends about 800 yards to the southeast.

Pitugu Bay, between Karangdato Point, 5° 52′ N, 121° 18′ E, and Tandican Point, on Jolo Island, is open to southward and has very deep water.

The coast of Pitugu Bay is fringed by a fairly wide coral reef which continues around Tandican Point. Here the reef is 1½ miles wide and bares at low water. There is a break in the reef, at the extreme east end of Jolo Island opposite Mount Baybay (1,275 feet) and Tandu Peak (1,312 feet), for a distance of 2½ miles.

The shore of Capual Channel (PLAN 38) is fringed by a narrow coral reef which extends to Tandu' Batu, broken only at Patotol Bay which is landlocked and has a mud flat. Along this stretch some mangrove is found. At Patotol Bay, however, the growth is much thicker than elsewhere.

Capual Island, situated off the northeast extremity of Jolo Island, is roughly circular, about 3 miles in diameter, and rises to a height of 976 feet near the southeastern shore. The north and west parts of the island are low and wooded, with some *cogon*. The shore is mostly sand beach with an occasional coral ledge. A narrow coral ledge extends northwest of the island with 1¾ fathoms ¼ mile offshore.

Bitinan Island is northeast of Capual Island, from which it is separated by a deep, clear channel. The south end of the island rises steeply to a wooded hill at 6° 03′ N, 121° 27′ E. This hill is 705 feet high. The northern part of the island is low.

(3) Anchorages.

The coasts of Jolo Island are slightly indented, forming several bays. The most sheltered and secure anchorage during both monsoon seasons is that of Dalrymple or Tulayan Harbor.

FIGURE IV - 236. *Jolo Island, NW coast.*
Jolo Anchorage from Mount Tumatangas. Daingapic Point and Mount Patikul in distance. Looking NE.

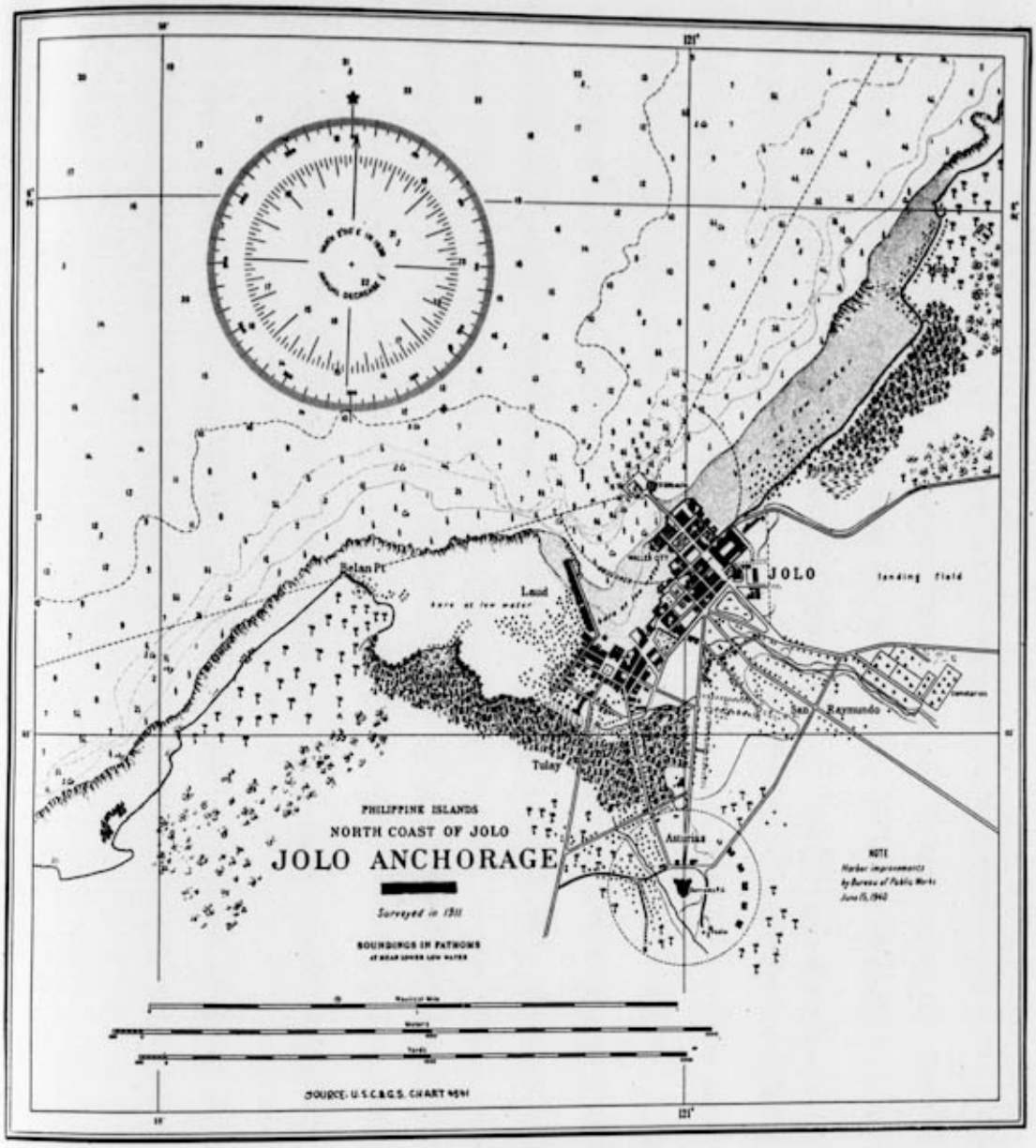


FIGURE IV - 237. *Jolo Island, NW coast.*
Jolo Anchorage. Section from U.S.C. & G.S. chart 4541.

(*a*) *Dalrymple Harbor* (PLAN 38). The best anchorage is southeast of Tulayan Island in 8 to 9 fathoms, coral-sand bottom. This anchorage is exposed to the northeast. During strong northeast winds better protection may be found in the lee of Tulayan Island, though the wind is seldom severe during this monsoon.

Entering by the western entrance to Dalrymple Harbor, the best water will be found by keeping ¼ mile off the west and south shores of the island and anchoring as directed above. Smaller vessels can go closer to the Jolo shore. The best protection is found in the lee of Tulayan Island.

(*b*) *Jolo Harbor.* For discussion of the anchorage in Jolo Harbor see Chapter VI.

(*c*) *Sulade Island.* Anchorage may be had at Sulade Island, on the bank that extends westward of the island in 6 to 9 fathoms, coral-sand bottom.

FIGURE IV - 238. *Jolo Island, NW coast.*
Jolo Harbor. Bus Bus beach and fringing reef at right. Laud village and reef beyond harbor. Belan Point in center background. Mangalis beach and Point in far left background. Looking W. 1935.

(*d*) *Parang.* Anchorage may be had off Parang in 9 fathoms, about ¾ mile from shore, with the galvanized-iron roof in Parang bearing 10° true and Tubingantan Point bearing 130° true. This is close to some fish traps. The bottom is coral sand; the anchorage is exposed during the southwest monsoon.

(*e*) *Maimbung Bay.* Vessels can anchor anywhere in Maimbung Bay, but the usual anchorage is about ⅜ mile southward of the town, with Dry Bank bearing 223° true in 8 or 9 fathoms, coral-sand bottom. Smaller craft may anchor a little closer inshore directly off the mouth of the river in 7 fathoms, mud and sand bottom.

(*f*) *Patian—Lumbian Islands channel.* There is anchorage in 12 fathoms in the channel between Patian and Lumbian Islands.

(*g*) *Tutu Point.* There are a number of shoals and reefs in the bay northward of Tutu Point. Small vessels might find anchorage space inside the outer reefs, but the shore reef bares almost ½ mile. The best landing seems to be at Pandanpandan, just inside Tutu Point.

(*h*) *Tutu Bay.* (FIGURES IV - 240 and IV - 241) Tutu Bay is sheltered from southerly winds by Pata Island. Anchorage may be had anywhere in the bay clear of the shore reef.

(*i*) *Capual Channel.* Anchorage may be taken anywhere in Capual Channel south of Capual. The bottom is coral and sand. The tidal currents are strong, but the channel is protected except from the southeast. The area northward of Liangliang appears to afford better protection.

(*j*) *Patotol Bay.* This bay is entirely landlocked. Near the entrance is an area where good anchorage may be had in 5 to 6 fathoms, mud bottom. The approach through the entrance is narrow and crooked. Ranges should be established before attempting to enter.

(4) Dangers to navigation.

(*a*) *Goitya Shoal.* This shoal, 1½ fathoms coral, lies 1 mile northwest of Capual Island, with deep water between it and the island. There is a 3-fathom shoal ½ mile northeastward and a 4¾-fathom shoal ½ mile southwest of Goitya Shoal.

(*b*) *Capual Channel.* This channel, between Capual and Jolo Islands is deep at the eastern end, but the western end is shoal, leaving a very narrow channel of 4 fathoms between the shoals extending off Capual and Bulicutin Islands.

(*c*) *Liangliang.* A ridge of coral and sand, with depths of 4 to 5 fathoms, that extends northward from the Jolo shore 1 mile eastward of Liangliang complicates the approach to the anchorage.

(*d*) *Bulicutin Island.* The eastern channel of Bulicutin Island is deeper than the western channel but is complicated by several shoals and coral rocks, the least depth of them being ¾ fathom.

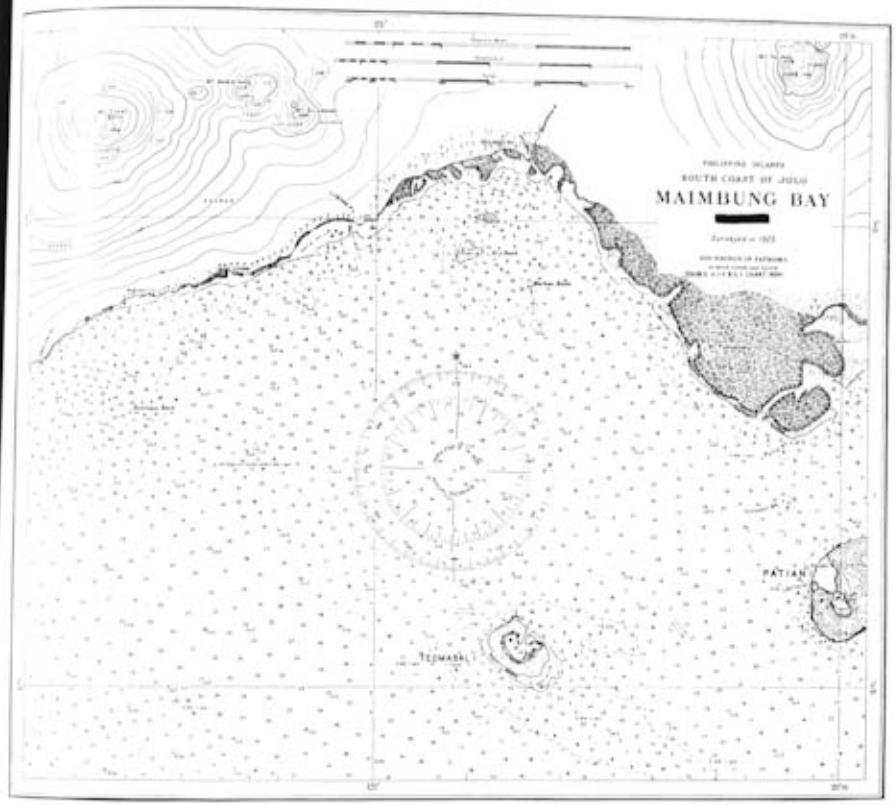


FIGURE IV - 239. *Jolo Island, SW coast.*
Maimbang Bay. Section from U.S.C. & G.S. chart 4541.

FIGURE IV - 242. *Jolo Island, S coast.*
Tutu Bay. Tuyang beach on W shore, between Mahala and Kabungkul, showing narrow strand and dense vegetation. Looking W.

FIGURE IV - 243. *Jolo Island, N coast.*
Taglibi. Section of coral beach. Looking S.

FIGURE IV - 240. *Jolo Island, S coast.*
Tutu Bay. Panorama of coast from Putic Point, left, to Karangdou Point, right. Looking W to E by way of N.

FIGURE IV - 241. *Jolo Island, S coast.*
Islands off Tutu Bay. Panorama, E to W by way o
showing Pata and other islands off south coa

FIGURE IV - 242. *Jolo Island, S coast.*
Tutu Bay. Tuyang beach on W shore, between Mahala and Kabungkul, showing narrow strand and dense vegetation. Looking W.

FIGURE IV - 243. *Jolo Island, N coast.*
Taglibi. Section of coral beach. Looking S.

FIGURE IV - 241. *Jolo Island, S coast.*
Islands off Tutu Bay. Panorama, E to W [illegible] S, showing Para and other islands off [illegible]

(*e*) *Jolo coast.* There are a number of shoals with depths of 1¾ to 2¾ fathoms off the Jolo coast between Bulicutin Island and Tandu' Batu.

(*f*) *Tandu' Batu.* A stone mole has been constructed at Tandu' Batu which is on the southwest shore of Dalrymple Harbor. The end of the mole must not be approached as there are broken submerged piles.

(*g*) *Eseo Bank.* This bank, 1½ miles from Caduayan at the head of the bay, consists of a number of shoals, the least depth on the bank being 2½ fathoms, sand and coral. There is another shoal, a coral head with a 1¾ fathoms over it, about ½ mile north-northeast of Caduayan.

(*h*) *Panganaa Island.* A small flat rock of reddish color lies just off the eastern shore of Panganaa Island, which is 1 mile eastward of Bancungan Island.

(*i*) *Bancungan Island rock.* A bare rock 20 feet high lies 380 yards off the northwest corner of Bancungan Island.

(*j*) *Buansa Shoal.* This shoal, with a depth of 4¼ fathoms near its outer end, extends ¾ mile offshore. It lies 1 mile 40° true from Candea Point.

(*k*) *Busson Rock.* This rock, which lies ¼ mile 317° true from Tulian Island, is awash at low water, with very deep water outside of it.

(*l*) *Matos Shoal.* This shoal, about 1½ miles northward of Silangon Point and ½ mile from shore, is covered to a depth of 4 fathoms.

(*m*) *Bunga Point.* The chart shows a 3-fathom shoal almost ½ mile westward of Bunga Point.

(*n*) *Batolaqui Bank.* This bank consists of a number of shoal patches extending about 1¼ miles easterly and southeasterly from Cabalian Point. These shoals are covered by 1 to 3 fathoms, with rock awash at low water on the western edge of the bank. The depth between the patches is 6 to 8 fathoms. There is a narrow channel with not less than 6 fathoms, between a small sand cay (islet) northward of the bank and Jolo Island.

(*o*) *Maimbung Bay.* Within the bay of Maimbung and fronting the town are 2 shoals. The southernmost is always bare and is named Dry Bank; the northernmost bares at half ebb. There are 4 other shoals: Marban Bank, with 6 feet least water on it, lies about ½ mile 120° true from Dry Bank; another shoal of 9 feet lies about ½ mile 171° true from the same bank and 2 patches of 27 to 29 feet lie 84° true and 92° true from Dry Bank. The depth between the shoals and the eastern shore is 5 to 15 fathoms.

(*p*) *Teomabal Island.* There are coral patches of 4 to 5 fathoms lying as much as 2¼ miles southeastward of the Island of Teomabal.

(*q*) *Garcia Shoal.* This shoal, lying ¼ mile southwestward from Lumbian Island, is of small area and covered by a least depth of 3½ fathoms.

(*r*) *Villamil Rock.* This rock, lying about ¾ mile southward of Putic Point, in the middle of the pass between Putic Point and Patian Island, is small and covered by a least depth of 4 feet. It is surrounded by deep water.

(*s*) *Serantes Shoal.* This shoal, covered by 1½ fathoms, lies about 3 miles east-northeast of Putic Point. A 2-fathom shoal lies in the middle of the bay eastward of Mabajoc Point, about ½ mile offshore. There are a number of shoals and reefs in the bay northward of Tutu Point.

(*t*) *Kamawi Island.* A coral reef extends about 500 yards off the southern shore of Pata Island and surrounds Kamawi Island, the latter being separated from Pata Island by a narrow high-water channel through the mangroves. Tanquique Rock is a small rock, 4 feet high, on the edge of the reef south of Kamawi Island. Coral reef also extends over 500 yards southeastward of Dongdong Island.

(5) Landing beaches.

The most numerous and accessible landing beaches on Jolo Island are found on the northern coast.

(*a*) *Tandu' Batu beach.* (PLAN 36, Section B(a); also PLAN 38) Reliability GOOD. The shores of Dalrymple Harbor for a distance of nearly 2 miles are lined with an interrupted sand beach which attains a maximum width of about 300 feet at low tide. The limits of the beach lie at 6° 00′ 40″ N, 121° 18′ 20″ E, and 6° 00′ 10″ N, 121° 19′ 30″ E. The approach to the beach is obstructed by Tulayan Island, a good landmark with its cone-shaped peak, which lies about a mile from the coast. Numerous shoals are scattered between the small island and Jolo, and the bottom slopes within the 30-foot depth vary from gentle to moderate, leading to a coral reef which interrupts the beach and lines both ends (PLAN 6). The bottom material is mainly coral sand. The beach is only partially sheltered from the northeast monsoon by Tulayan Island. The mean range of the tide is about 4 feet; the tidal current moves westward on flood. The beach is composed of coral sand and has a slope of about 1 on 8 near the high water line, but is flatter to seaward.

The beach is interrupted by a mangrove-bordered fringing coral reef just east of the settlement of Tandu' Batu. The beach is generally firm, but may be locally soft toward the east where it is bordered by marshy terrain. Surf is generally light; shore drift is mainly eastward. There is a stone pier about 600 feet long at Tandu' Batu. It extends into 5 feet of water at low tide. A road from its head leads inland and then westward, ultimately reaching the town of Jolo. The terrain inland is generally low, rising to hills farther south. It is wooded, with some areas of cultivated fields. Westward of Tandu' Batu are several villages, fronted by coconut palms, at which landings may be possible.

(*b*) *Caduayan beach.* (PLAN 36, Section B(b); FIGURE IV - 235) Reliability FAIR. On both sides of the settlement of Caduayan for a total distance of about 2 miles is a coral-sand beach, partly fronted by a fringing reef. The limits of the beach lie at 6° 00′ 00″ N, 121° 12′ 10″ E, and 6° 00′ 10″ N, 121° 13′ 40″ E. Mount Lirut and Mount Dakula are conspicuous landmarks along this coast. The approach to the beach is clear except for Eseo Bank, a linear belt of shoals which lies 1 to 2 miles directly offshore. Nearer shore, the bottom slopes are moderate to the beach. Bottom materials are mainly coral sand. The beach is exposed to winds and waves from the north, and heavy swell reaches it from the northeast during the northeast monsoon. The mean range of the tide is about 3 feet; the flood tidal current moves westward along the shore. The beach is composed of coral sand and is generally firm. It has a slope of about 1 on 8 near the high water line, and during high tide the beach is narrow. No structures are present along this beach so far as is known. Surf is heavy when swell is running. Shore drift is variable, but mainly westward.

The terrain behind the beach is low and partly cultivated in

the central part. Lake Seit lies about ¼ mile inland. A hill, 305 feet high, is located a short distance west of the lake. The shoreline behind the beach is locally lined with coconut palms. A road leads from the beach to join the main highway which leads westward to the town of Jolo and generally eastward to Tandu' Batu.

(*c*) *Igasan Point beaches.* (PLAN 36, Section B(c)) Reliability FAIR. Two sand beaches, each about 1 mile long, occur in the vicinity of Igasan Point. The centers of the beaches lie at 6° 03′ 20″ N, 121° 10′ 00″ E, and 6° 04′ 40″ N, 121° 08′ 10″ E. Bancungan Island, which lies east of Igasan Point, is triangular and has a hill 508 feet high. The approach to the beach is obstructed by the island, but within the 30-foot depth the approach is unobstructed and the bottom slopes are moderate. Igasan Point, between the beaches, and the beach to the west of the point are partly fronted by a fringing coral reef. Bottom material consists of sand and mud partly of coral origin.

The beaches are exposed to the northeast, and hence are subject to heavy swell during the northeast monsoon. The mean range of the tide is about 2 feet and the flood tidal current moves northwestward along the shore. The beaches are composed of coral sand, and they have slopes ranging between 1 on 6 and 1 on 10. The beaches are narrow at high tide and are firm. No structures occur along them. Surf is heavy when swell is running. Both beaches are backed by a fringe of coconut palms. The inland terrain along the northern beach slopes gradually to a hilly interior, whereas a short distance southeast of the southern beach is a hill 1,045 feet high, and another closer to the shore 310 feet high. A trail parallels the shore behind both beaches at a distance of less than 1,000 feet from the beach. This trail runs southeastward to connect with the main island road about 1½ miles west of Caduayan.

(*d*) *Taglibi beach.* (PLAN 36, Section B(d); FIGURE IV - 243) Reliability FAIR. For a distance of about 5 miles from a point a short distance east of Taglibi westward to beyond Patikul is a narrow coral beach fronted by a fringing coral reef. The limits of the beach lie at 6° 05′ 30″ N, 121° 07′ 00″ E, and 6° 05′ 10″ N, 121° 02′ 30″ E. About 1 mile southwestward of Patikul is Mount Patikul rising to 823 feet. The approach to the beach is clear; within the 30-foot depth the bottom slopes are moderate and steep to the narrow, fringing reef. The bottom material is mainly coral sand. The beach is exposed to the north and is subject to winds and swell during the northeast monsoon. The mean tidal range is approximately 2 feet and the tidal current moves westward on flood. The beach itself is narrow, but firm enough to support wheeled vehicles. It is composed of coral sand and has slopes averaging 1 on 10. The best part of the beach is reported to be at Taglibi, where fresh water may also be obtained. There are no structures along the beach. Surf is heavy when swell is running and shore drift is mainly westward along the beach. A trail or road runs close inland behind the beach area and is easily accessible from the

FIGURE IV - 244. *Jolo Island, NW coast.*
Jolo Harbor. Town of Jolo in center. Bus Bus beach and reef at left. Laud village and reef at right. Looking E. 1935.

beach. This road continues southwestward about 5 miles to the town of Jolo.

(*e*) *Jolo beaches.* (PLAN 36, Section B(e); FIGURES IV - 236 and IV - 237) Reliability GOOD. For a distance of about 2½ miles on each side of Jolo is a discontinuous coral-sand beach, extending essentially from Daingapic Point to Mangalis Point. The limits of the area lie at 6° 05′ 20″ N, 121° 01′ 00″ E, and 6° 02′ 40° N, 120° 58′ 40″ E. Jolo may be recognized by its concrete wharf with a light-tower near its head. The approach to the beach area is clear, within the 30-foot depth the bottom slopes vary from gentle to moderate to the fringing coral reef which fronts most of the beach on both sides of the harbor (FIGURE IV - 244). The bottom material is mainly coral sand.

The beach is exposed to the northwest and is partly sheltered from the east, although northeast swell bends around Daingapic Point and breaks along the shore. The mean range of the tide is about 2 feet, and the flood tidal current moves southwestward along the coast. A general view of the vicinity of Jolo is shown in FIGURE IV - 238. This shows part of the beach east of the town, as well as 2 of the beaches on the west. All of the beaches are composed of coral sand, and they are firm. The fringing reef in front of the beaches is generally narrow, seldom exceeding 500 feet wide. At Bus Bus the reef is covered with coral sand. The average slope is about 1 on 8, and the beaches are relatively narrow (FIGURE IV - 245). Clusters of native dwellings extend over the water both along the beach east of the harbor and westward at Laud (FIGURE IV - 246). There are no structures other than these houses along the beaches proper, but the harbor has extensive developments, as shown in FIGURE IV - 244. Surf along the beaches varies in intensity and is probably heaviest westward of Belan Point. Shore drift is predominantly southwestward. The town of Jolo lies on a plain which rises gradually to the southward. A number of roads radiate from the town, but the beaches between Belan and Mangalis Points are backed by dense woods with a fringe of coconut palms along the shore. Mangrove lines the shore between the harbor and Belan Point. Much of the plain southwestward of Jolo is cultivated and a landing field is located a short distance east of the town. A radio station is located south of the town. Fresh water suitable for drinking is piped to the wharf.

(*f*) *Candea beach.* (PLAN 36, Section B(f)) Reliability FAIR. A sand beach, about 2,000 feet in length, lies in front of the village of Candea about 5 miles west of the town of Jolo. The beach lies at 6° 01′ 55″ N, 120° 56′ 10″ E. Mount Tumatangas, 2,664 feet high, and the highest peak on the island, lies inland about 3 miles southeast of the beach. The approach to the beach is clear, but within the 30-foot depth the bottom slopes are steep to the fringing coral reef which fronts the entire beach. The reef is about 400 feet wide at the west and nar-

FIGURE IV - 245. *Jolo Island, NW coast.*
Jolo town. Bus Bus beach. Looking SE. 1935.

FIGURE IV - 246. *Jolo Island, NW coast.*
Jolo Harbor. Near view of Laud village and reef. Looking E. 1936.

rows to the east along the beach. The beach is exposed to winds and swell from the northeast. The mean range of the tide is about 2 feet, and the flood tidal current moves southwestward. The beach is composed of coral sand and debris and is generally firm. It has a slope of about 1 on 8. There are no structures along the beach. Surf varies in intensity, but is heaviest when swell approaches from the northeast. Shore drift is variable. The beach is backed by a fringe of coconut palms and by a small village which lies along a narrow coastal plain. Behind it are moderately steep, wooded slopes. A trail runs along the slopes about ¼ mile inland from the beach. It is probably accessible from the village of Candea. This trail runs east to Jolo and southwest to Silangkan. Between Candea and Silangkan are several villages at which landings may be possible, but information is lacking.

(*g*) *Silangkan beaches.* (PLAN 36, Section B(g); FIGURE IV - 247) Reliability FAIR. Between the village of Silangkan, on the west coast of Jolo, and Bunga Point, a distance of about 4½ miles, there are at least 3 short coral beaches. These are located at 5° 58′ 40″ N, 120° 53′ 20″ E; 5° 57′ 30″ N, 120° 52′ 30″ E; and 5° 55′ 10″ N, 120° 52′ 40″ E. The approach to this part of the coast is clear with the exception of Matos Shoal, which lies opposite the village of Silangkan about a mile from shore. Another shoal lies about ½ mile west of Bunga Point. Within the 30-foot depth the bottom slopes range from moderate to gentle to the coral reef which fringes the entire shore. The bottom material is mainly coral sand. The beaches are relatively sheltered from the northeast monsoon, but they are exposed to winds and swell during the southwest monsoon. The mean range of the tide is about 2 feet; the flood tidal current moves southward along the shore, probably swinging outward in the vicinity of Bunga Point, with the development of tide rips in the area southwest of the point.

The beaches are composed of coral sand and debris and they have a slope of about 1 on 8, flattening somewhat toward the fringing reef. The beaches are generally less than 50 feet wide at high tide, but they are firm enough to support wheeled vehicles. No structures are present along the beaches, with the exception of a few houses built on piles over the water. Surf is fairly heavy when waves are running, and shore drift is variable. The beaches are backed by coconut groves, leading to the wooded interior. The land is generally low, rising to hills in the east. A main road runs inland from Silangkan, leading ultimately to the town of Jolo. Landings may be possible at other villages between Silangkan and Bunga Point, but data are lacking.

(*h*) *Parang beach.* (PLAN 36, Section B(h); FIGURE IV - 248) Reliability FAIR. A sand beach, about 1 mile long, lines the shore at the village of Parang on the southwest coast of Jolo. The center of the beach lies at 5° 54′ 50″ N, 120° 54′ 30″ E. Mount Tukay, 2,034 feet high, lies about 3½ miles northeast of the village. The offshore approach to the beach is clear, and within the 30-foot depth the bottom slopes are gentle to moderate, leading to the fringing coral reef which fronts the beach. The bottom material is coral sand. The beach is exposed to the southwest and is subject to heavy swell during the southwest monsoon. The mean tidal range is about 2 feet, and the flood tidal current moves northwestward along the shore, probably

FIGURE IV - 247. *Jolo Island, W coast.*
Silangkan. Coral-sand beach, looking N. 1928.

FIGURE IV - 248. *Jolo Island, SW coast.*
Parang. Coral beach, looking S. Tapul Island in distance. About 1928.

swinging outward in the vicinity of Bunga Point into a zone of tide rips southwest of that point.

The beach is composed of coral sand and has a slope of about 1 on 10. It is firm enough for vehicles, although at high tide it is relatively narrow. There are no structures other than houses built over the water. Surf is heavy when swell is running and shore drift is variable. The beach is backed by coconut groves and cultivated fields rising in gentle slopes toward the wooded hilly country on the east. Two roads lead from Parang, one northward to Silangkan, and the other northeastward to the town of Jolo.

(*i*) *Maimbung Bay beaches.* (PLAN 36, Section B(i); FIGURE IV - 239) Reliability FAIR. Along the western shore of Maimbung Bay between Tubingantan Point and the village of Maimbung are several short beaches, probably not exceeding 1,000 feet in length, located at small villages and separated by areas of mangrove. The limits of the beach area lie between 5° 53′ 40″ N, 120° 55′ 20″ E, 5° 55′ 40″ N, 121° 01′ 30″ E. Mount Tukay, 2,034 feet high, lies about 3½ miles northeast of Tubingantan Point at the western limit of the section. Several shoal areas lie in the offshore approach to this area; namely, Batolaqui Bank east of Cabalian Point, Dry Bank, and Marban Bank, within about 2 miles offshore of the town of Maimbung at the head of the bay. Within the 30-foot depth the bottom slopes are moderate to steep. A fringing coral reef lines the shore in this area from Maimbung for about 4 miles southwestward, and attains a maximum width of about 1,500 feet.

The beaches are exposed to heavy winds and swell during the southwest monsoon. The mean tidal range is about 3 feet, and the flood tidal current moves westward offshore. Tide rips may be encountered in the approaches to the bay. The beaches along the western half of the area are composed of non-coral sand and may locally attain a width of 300 feet at low water. Farther east the beaches are composed of coral sand and debris; they are narrow and firm and have slopes of about 1 on 8 to 1 on 15. No structures are known to be present along these beach-

es except that houses may be built on piles out over the water. Surf may be heavy during the southwest monsoon which sets in in June. Shore drift is weak and variable, but predominates to the southwest along the shore. Directly behind the beaches are fringes of coconut palms which lead inland to a narrow, wooded plain rising to the northward up wooded slopes. A trail runs along the slopes about a mile inland along the west, but swings to about ½ mile from shore near Maimbung. From Maimbung a main road runs northward across the island to the town of Jolo.

(*j*) *Tutu Bay beaches.* (PLAN 36, Section B(j); FIGURE IV - 242) Reliability FAIR. Three small coral-sand beaches are known to occur along the low, mangrove-bordered shores of Tutu Bay, between Mabajoc Point and Tutu Point. These beaches occur at 5° 54′ 50″ N, 121° 08′ 10″ E; 5° 55′ 30″ N, 121° 08′ 10″ E; and 5° 54′ 30″ N, 121° 14′ 10″ E. The approach to Tutu Bay is obstructed by some half dozen islands of which Pata Island, rising to an elevation of 1,385 feet, is the most prominent (FIGURE IV - 241). Near shore are numerous shoals and reefs within the 60-foot depth; the bottom slope within the 30-foot depth is moderate to the fringing coral reef which lines the entire bay shore. The bottom material is mainly coral sand. The beach area is exposed to the south and southwest; it is partly sheltered by the off-lying islands, but southwest swell reaches the bay shores. The mean range of the tide is about 3 feet, and the flood tidal current moves generally westward among the islands fronting the bay. Tide rips are developed in the vicinity of these islands.

The several beaches along the bay are generally not more than 1,000 feet long and are relatively narrow. They are composed of coral sand and have slopes of about 1 on 6 to 1 on 10. The beaches are firm. Surf on the several known beaches is generally light, because of local sheltering. No structures occur on the beaches and shore drift is variable. The beaches are backed by a fringe of coconut palms or by dense thickets of natural vegetation (FIGURE IV - 242). The western and eastern shores of Tutu Bay rise inland to hilly country, but a broader area of lowland extends behind the central portion of the bay. A trail generally parallels the shore and connections are afforded from the shore trail to the main island roads which connect with Caduayan and Jolo on the north shore. Between the several beach areas in Tutu Bay the shore is generally lined with dense mangrove and with local swampy tracts at the inner edge of a broad, fringing reef. Landings may be possible at some of the other villages along the bay, but information is lacking.

(*k*) *Pitugu beaches.* (PLAN 36, Section B(k)) Reliability FAIR. Two coral sand beaches occur at and near the village of Pitugu along the southeastern shore of Jolo Island, at 5° 53′ 20″ N, 121° 18′ 40″ E and 5° 54′ 10″ N, 121° 19′ 50″ E. These beaches are less than 1,000 feet long and are narrow above the high water line. The approach to the shore area is clear to the 30-foot depth; within that depth the bottom slopes are steep to the fringing coral reef which fronts the shore. A channel cuts through part of the reef to Pitugu; at the settlement of Kuta' Sihi' the fringing reef is about 1,000 feet wide. The bottom material is coral sand. The beaches are exposed to the southeast and are subject to winds and waves from the general southern quarter. The mean range of the tide is about 3 feet and the flood tidal current moves southwestward along the coast. Tide rips occur offshore southeast and southwest of the beach areas.

The beaches themselves are composed of coral sand, are firm, and have slopes averaging 1 on 8. No structures are present along these beaches. Surf may be moderate when swell approaches. Shore drift is variable but with a prevailing southwestward trend. The beach area is backed by a fringe of coconut palms leading inland to wooded slopes with grassy patches. A trail leads from the village of Pitugu northwestward into the hills and joins ultimately the road system of the island. Southwestward of Pitugu the shore is lined with mangrove, and locally the inner portion of the fringing reef may be marshy. Landings may also be possible at several other points along this shore.

45. *Northeast Borneo*

A. Jesselton: Dumpil Point to Gaya Head. (PLANS 39 and 41)

(1) Offshore zone.

From Dumpil Point to Aru Point the 5-fathom curve lies parallel to the shore about ½ mile out, although it is only ¼ mile out directly off Dumpil Point. To the west and northwest of Aru Point there are numerous shoals and reefs within a 1-mile radius of the point. The 10-fathom curve is 1¼ miles out off Dumpil Point. Off Aru Point the 10-fathom line is 2 miles out and passes 250 yards west of Mamutik Island. The sea bottom off this stretch of coast has a gentle slope of 1 on 145 to the 10-fathom line. West of Aru Point are 3 islands, Sulug, Mamutik, and Manukan.

From Aru Point to Lipat Point the offshore zone is choked with numerous shoals and reefs especially between Gaya Island and the mainland of Borneo. A tedious channel leads from the fairway south of Gaya Island through the network of reefs to Jesselton Harbor. The 5-fathom line passes westward where it approaches the fringing reef of Gaya Island very closely. The 10-fathom line also parallels the fringing reef around Gaya Island about 250 yards beyond the 5-fathom line.

From Lipat Point northward along the eastern shore of Gaya Bay the 5-fathom line passes about a mile off the delta of the Inanam River. Farther north off Lita Point the 5-fathom line approaches to within about 600 yards of the coast. To the northward are numerous reefs and shoals, most of which are included between the 5-fathom line and the coast. In Sapangar Bay the 5-fathom curve passes about 200 yards off the edge of the fringing reef that extends along the coastline of Sapangar Bay. The 10-fathom curve trends irregularly about 1¼ miles to 1¾ miles out on a line between Lipat Point and Melanim Point.

Gaya Bay, with depths ranging between 10 and 17 fathoms over a mud bottom is fairly clear except for Creighton Patch, a shoal patch with 5 to 8 fathoms over it, 1¼ miles north-northwest of Lipat Point. The southern entrance to Sapangar Bay is clear but the western entrance is almost blocked by 3 islands, Sapangar, the largest, Udar, and Little Udar (Udar Kechil). Off these islands the water drops off rapidly along the edges of the fringing reef.

(2) Coastal topography.

From Dumpil Point north to Aru Point the coast is a gentle curve, concave seaward. Dumpil Point, about 180 feet high, has some trees but is not conspicuous. A stream of the same name enters the sea a mile to the south of the point. Aru Point is low

and flat. From Dumpil Point past Aru Point to the Napas River is a long sandy beach (PLAN 41, Section A(a)).

Along the coast to the northward, sandy beaches of considerable length are separated by rocky bluffed headlands which rise steeply from the sea, or, as at Jesselton, from behind a narrow beach, to heights of 150 to 1,000 feet. On the eastern shore of Gaya Bay a flat extends 1,400 yards off Lita Point which is about 3 miles northeastward of Jesselton. On its edge are rocks 4 and 5 feet high with a patch of 1½ fathoms at 700 yards southwestward of the 5-foot rock.

Coral reef, dry in places, fronts Tarak Tarak Point, the south side of the approach to Menggatal or Kabatuan River, to the distance of 800 yards offshore and extends northward to 1,400 yards of that river. Coral reef also borders the head of Sapangar Bay; 4 patches on this reef dry, as charted. Behind the beaches, irregular, discontinuous and locally swampy plains border the coast and extend inland along the 3 major rivers, the Petagas, Inanam, and Menggatal or Kabatuan. Menggatal or Kabatuan River has a depth of about 2 feet on its bar, and deepens within. The entrance may be distinguished by a yellow sandstone bluff on its northern bank, and the abrupt angle of the coast on the southern shore. The bar appears to be composed of coral, and is a continuation of the line of reef fronting the shore. Mangrove swamps border the mouths of nearly all streams and sand bars lie across the outlets. Rounded isolated hills several hundred feet high rise abruptly from the plains. Further inland a belt of rolling sandstone ridges rises to a height of more than 2,000 feet. The foothill ridges merge gradually with the steep-sloped mountains of the interior, which are 3,000 to 8,000 feet high. Gaya and Sapangar Bays are the most secure harbors; Jesselton is the most important town.

The plains along the coast are underlain by soft sandy clay soil, in places swampy; inland, near the hills, the ground is firm and well drained. Foothills are largely of sandstone, with some shale, overlain by generally thin sandy clay soil. Slopes are slippery when wet. The interior mountains, underlain by harder rocks, have more cliffs and ledges.

The beaches are sandy and are mostly covered with casuarina trees or bordered with coconut trees. The plains are under cultivation except where swampy. Mangrove and nipa are to be found near the coast along the rivers. Many low hills near the coast are bare and covered with *alang-alang* grass; others are in orchard; a few are covered by dense second-growth jungle. The high hills inland are densely forested.

The island of Gaya about 4 miles long, northwest—southeast, by 1½ miles in average breadth, is very hilly and has a bare summit of 950 feet. Most of the island is densely wooded, and its shores are fringed by reefs to a distance of 200 to 400 yards. The reef at Torajun Point, the northeastern extremity, extends nearly 500 yards and is known as Breaker Point; southward of this point is Malohom Bay. The western shore of the island is steep and unbroken, but the other sides are indented, affording shelter under their lee, according to the prevailing monsoon.

Sinjataan or Loney Island, 355 feet in height and thickly wooded, is connected with the southwest point of Gaya by a flat that is covered to a depth of about 1 foot at low water. Shallow water extends 400 to 600 yards south and southwest of the island and 400 yards off its northwest point.

To the south of Gaya Island lies the island of Manukan, 352 feet high and about 1 mile in length east—west. It is the largest and the northernmost of 3 islands situated in the fairway, at 2½ to 3 miles north-northwest of Aru Point. Manukan Island is fringed by a reef to a distance of 250 yards, except along its northern side. A detached shoal, dry at its south end, lies about 800 yards eastward of the island. The shoal is steep-to and there is a depth of 12 fathoms between the shoal and Manukan Island.

Approximately ½ mile southeast of Manukan Island lies the Island of Manutik, 208 feet high, with shoal water extending 150 yards from its northern end and 600 yards from its southern extremity.

Sapangar Island, 670 feet high and densely wooded, lies on the north side to the approach of Sapangar Bay; it is 1⅓ miles in length, and is nearly connected with the coast northeast of it by Udar Island and reefs. Shoal water extends 400 yards off its southern and eastern extremities, and about ⅓ mile off its northern extremity.

Northeast of Sapangar lie 3 small islands known as Udar, Little Udar (Udar Kechil), and Udar Priok. Udar Island is 201 feet high and has a narrow but deep channel on the either side of it. Little Udar Island, 166 feet, and Udar Priok, 97 feet, lie between Sapangar and the coast northward of Melanim Point.

(3) Anchorages.

During northerly winds vessels can anchor off the south side of Manukan Island, in a depth of 14 fathoms, over a mud bottom.

Deep-water anchorage is afforded by Gaya and Sapangar bays, with shelter according to the prevailing monsoon. In Jesselton Harbor, the south end of Gaya Bay, there is fairly secure anchorage at all times, on the east side of Gaya Island. The anchorage at the south end of Gaya Bay, between the reef upon which is found Plompong Island and the reef which extends 500 yards off Sindian Point, is good, having depths of about 8 fathoms; it is protected from northward by Plompong Island reef. See Chapter VI for additional information on anchorage in Jesselton Harbor.

Anchorage may be obtained in depths of 9 to 12 fathoms off the Menggatal or Kabatuan River or northward toward the head of Sapangar Bay.

(4) Dangers to navigation.

Dumpil Rock, which dries 1 foot, lies near the edge of the reef, which extends over a mile off Dumpil Point. The reef extends 300 yards north of the rock while 800 yards south of the rock is a drying patch.

Snake Rock, 3 feet high, is situated about midway between the south channel and the southeastern extremity of Gaya Island.

Aru Point is a low flat point with foul ground and rock patches which uncover at low water, extending 1⅜₀ miles westward from it. The outer of these shoals has a depth of 3 feet.

The channel between Mamutik Island, with the reef northeastward of it, and the reef extending from Aru Point, is ½ mile broad, but it is obstructed by 2 shoals, of which the western shoal has 1 fathom of water, and the eastern shoal a depth of 3½ fathoms. This channel is used by small vessels approaching Jesselton from the southwestward, but it is not marked. The shoal on the north side of the approach, with 7 to 10 feet of water, was marked on its southern extremity by a red beacon, and by a white beacon eastward of it. A 3½-fathom patch lies

200 yards to the southward of this shoal. This channel is not marked.

Bulijung Point, the northwestern extremity of Gaya Island, has a sunken rock about 200 yards from it, and shallow water for 200 yards further. The island should be given a berth of 600 yards unless seeking anchorage.

Plompong Island, 46 feet in height, is situated about 600 yards within the extremity of the reef which extends 1,540 yards east-southeastward off Logong Point, of Gaya Island on the west side of Jesselton Harbor. This reef extends ½ mile southward of Plompong, with patches dry at low water.

(5) Landing beaches.

(a) Aru Point beach. (PLANS 39 and 41, Section A(a); FIGURE IV - 249) Reliability FAIR.

1. Location and extent. From 2½ to 6½ miles south of Jesselton, 5° 57′ 33″ N, 116° 03′ 28″ E, to 5° 54′ 07″ N, 116° 02′ 08″ E, a 5-mile-long beach borders the shore.

2. Nearshore. The 30-foot line lies about 3,000 feet offshore, and, for the most part, there are no off-lying dangers. However, the part of the beach rounding Aru Point, and east of that point, has unfavorable offshore approach; for more than a mile from the beach shoals, coral patches, and other dangers have little depth over them. South of Aru Point the sand and mud bottom slopes gently and uniformly, and the approach is clear. From November to April northerly winds prevail, and, though the beach is partly protected by islands to the north and northwest, light to moderate surf may be expected (FIGURE IV - 249). From April to November winds are from the south; during this period the surf is least heavy. Tidal range is about 5 feet.

3. Character of beach. Around and to the east of Aru Point the beach is fine coral sand and mud, fronted by a tidal flat 1,000 to 2,000 feet wide. This flat may not be passable at low water. South of Aru Point the beach is sand; it is generally more than 50 feet wide above high water and has a gentle slope (FIGURE IV - 249). Bathing is reported to be excellent about ¾ mile south of the point. Near the southern end, the beach is fronted by coral reef. A 220-foot hill near the beach, about 3,000 feet north of Dumpil Point, marks the approximate northern limit of reef. About ¾ mile south of Aru Point the beach is crossed by a small stream; this stream can be waded, and it probably has no important effect on beach firmness. The Patagas River crosses the beach about 7,500 feet north of Dumpil Point; the mouth is more than 100 feet wide and the banks upstream are fringed with mangrove. A railroad bridge crosses the river 3,000 feet upstream from the beach. Probably the river mouth can be waded, but soft beach in this vicinity is an obstacle to motorized equipment.

4. Adjacent terrain and exits. The beach is backed by a narrow belt planted with coconut palms. Between this belt and the railroad, which parallels the beach at an average distance of ½ mile, the country is low; part of it is cultivated (around the village of Linsok, in the south) and in the northern part there is a race-course. Elsewhere, the surface is low and may be in part swampy. It is passable for infantry with the possible exception of the area adjacent to Patagas River. There is a radio station 1 mile southeast of Aru Point. The nearest drinking water and other facilities are to be found at Jesselton, 2½ miles north of the northern end of the beach.

Along the coast, south of Dumpil Point are beaches similar to the one described above.

(b) Gaya Island, southeast coast beaches. (PLAN 41, Section A(b); FIGURE IV - 250) Reliability POOR. Two beaches on the southeast shore of Gaya Island face the town of Jesselton (FIGURE IV - 250). The southern beach is about 1,300 feet long, its center is at 5° 59′ 58″ N, 116° 03′ 52″ E; the northern beach is 2,700 feet long and at 6° 00′ 35″ N, 116° 03′ 42″ E. The offshore approach is largely blocked by numerous irregular sandy and coral shoals. Near the center of the northern beach the 30-foot line approaches within 400 feet of the beach; elsewhere it averages 1,500 to 2,000 feet offshore, and its outline is sinuous. The beaches are fairly well protected from all winds by off-lying shoals and islands; the tide range is about 5 feet. The beaches are fine sand, and are narrow, in places being no more than 10 feet wide. A number of native houses are built on and just behind the beaches at the edge of steeply rising, densely wooded country. Travel to and from the beaches is by native boat; there are probably no facilities of any kind.

(c) Gaya Island, Malohom Bay beach. (PLAN 41, Section A(c)) Reliability POOR. A 3,500-foot beach facing north, near the east end of Gaya Island has its center at 6° 00′ 32″ N, 116° 03′ 10″ E. The beach is 2 miles (airline) from Jesselton pier. The 30-foot line lies 600 to 1,000 feet offshore and the approach is clear except for sand and mud spits which extend out to a maximum of 1,200 feet from the beach. From November to April northerly winds may cause moderate surf. Tidal range is 5 feet. The beach is fine sand and mud, and may be in places no more than 10 to 15 feet wide. Steep, densely wooded

FIGURE IV - 249. *Northeast Borneo, Jesselton area.*
Sand beach southward of Aru Point, about 4 miles SW of Jesselton, looking northwestward. Beach slope and surf are probably typical of beach between Aru Point and Dumpil Point. 1932.

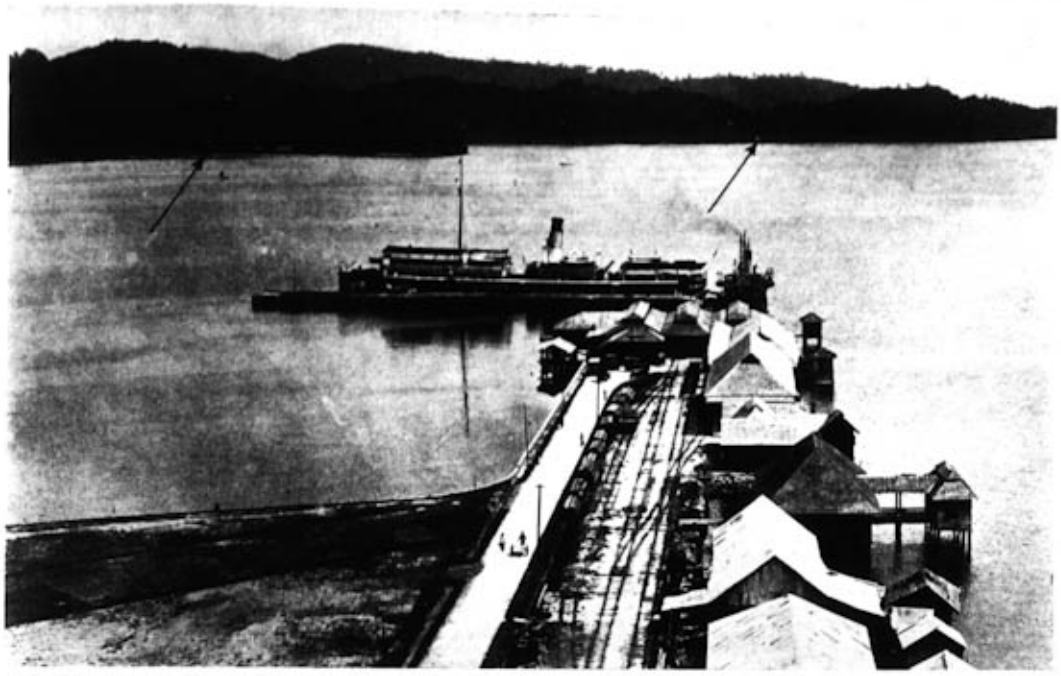


FIGURE IV - 250. *Northeast Borneo, Jesselton area.*
Gaya Island and Jesselton Harbor, Jesselton pier in foreground. Looking northwestward. Arrows indicate approximate centers of beaches on Gaya Island. (PLAN 41, Section A(b))

hills rise immediately behind the beach. Exit is by boat only, and there are probably no facilities nearer than Jesselton.

(*d*) *Inanam River beach.* (PLAN 41, Section A(d)) Reliability POOR. A beach 2 miles long, east-northeast of Jesselton, faces, and is concave toward the northwest. Its limits are 6° 00′ 35″ N, 116° 06′ 52″ E and 5° 59′ 28″ N, 116° 05′ 47″ E. The center of the beach lies almost east of Lipat Point, which is the north end of the hills behind Jesselton. The 30-foot line is about 6,000 feet offshore, the approach is clear except for 2 sand and mud shoals with a minimum depth of 1 to 2 feet. The bottom slopes very gently. From November to April there may be several lines of low surf; at other times the beach is well protected. Tidal range is 5 feet.

The beach is fine sand and mud, and is fronted by a tidal flat 2,500 feet wide. This flat probably is not passable at low water. At the north end the beach is limited by the Inanam River, 500 feet wide, which is too deep to wade. Elsewhere the beach is flanked and backed by low ground, which is in part swampy. It is probable that this ground is passable for infantry. The nearest facilities are at Jesselton, 1¼ miles from the west end of the beach.

(*e*) *Inanam River—Menggatal River beaches.* (PLAN 41, Section A(e)) Reliability POOR. A discontinuous beach 2¾ miles long borders the shore from 6° 03′ 37″ N, 116° 07′ 02″ E, to 6° 01′ 17″ N, 116° 06′ 34″ E. The central part of the beach is in sight of the Jesselton pier about 4 miles to the southwest. Near the north end there is a conspicuous yellow patch on the hills behind the beach; the southern end is near the end of the coastal hills. The course of the 30-foot line is irregular. The bottom slopes up steeply to coral patches and other dangers. Inward from these, depths average 2 to 3 feet. Elsewhere, the following conditions are in general present: opposite the headlands which interrupt the beach the 30-foot line swings outward, and there are reefs and other shoals; between the headlands there is deeper water nearshore, and the approach is clear. The beach area is well protected from all but strong winds from the north, and waves and surf are negligible. Tidal range is 5 feet.

The beach is sandy, and is generally firm. It is interrupted by 4 low, rocky headlands, which can probably be crossed by tracked vehicles. The beach is fronted by a fine sand or mud tidal flat 1,000 feet wide near the north and south ends and 500 feet wide, or less, elsewhere. The flat may not be passable on foot at low water. The beach is flanked at both ends by low, mangrove-covered country at the mouths of rivers too deep to wade (Menggatal in the north, and Inanam in the south). Immediately back of the beach the ground slopes steeply to hills 350 to 700 feet high, behind which, for a short distance, the country is probably flat and in part swampy. There are pier ruins near the north end of the beach. There is no information as to water supply or other facilities nearer than Jesselton.

B. Marudu Bay Area.

(PLANS 39 and 42)

(1) Offshore zone.

(*a*) *Western side.* At Sampanmangio Point, the western entrance point of Marudu Bay, the 10-fathom curve lies 1⅓ miles off the point and ½ mile off the northern side of Kalampunian Island. There is a safe channel 500 yards wide and 6 fathoms deep between Kalampunian Island and Sampanmangio Point. Three and one-half miles southeastward of Sampanmangio Point the 10-fathom curve lies only ⅓ mile offshore, but about 2 miles northwest of Point Aru, it suddenly extends to

about 1½ miles offshore. Between Point Aru and Kudat Harbor the 10-fathom line lies ¾ mile to 1¼ miles off the coast. South of Kudat Harbor the line swings farther and farther out from shore.

North of Kudat, the 5-fathom line lies 1,000 to 2,000 feet offshore. The distance is about 3,000 feet near Kudat, and gradually increases southward.

The greater part of Kudat Harbor is shallow. The 10-fathom curve passes outside the harbor, 500 yards off Sandilands Rock, which somewhat blocks the harbor entrance. The 5-fathom curve passes south of Point Bornugus, close off Gueritz Rock, and then south-southwest to the very edge of the coral reef that borders the southern shore of Kudat Harbor. (PLAN 42)

(*b*) *Eastern side.* The 10-fathom curve lies about 2 miles off Cape Mafsie, the eastern entrance point of Marudu Bay, and trends slightly west of south to Zebra Reefs. The 5-fathom line more nearly parallels the shoreline. (PLAN 42)

(2) Coastal topography.

Marudu Bay, into the head of which the Marudu River discharges, is about 25 miles long, north—south, and about 11¾ miles wide at its entrance. It is bordered by hills which rise steeply from the water or from narrow sandy beaches. The rivers flowing into Marudu Bay shift their channels after each rainy season, and are only available for boats after the beacons have been placed in position again.

(*a*) *Western side.* Low hills rise from the western shore of this bay to a height of about 500 feet; Melau Besar, 680 feet high, and Matungun, 1,360 feet high, are easily recognized, the summit of the former being bare and flat, while the latter is thickly wooded.

Sampanmangio Point, the northwestern extremity of Borneo and the western point of Marudu Bay, though somewhat low, is readily distinguished by the tall casuarinas which rise from its grassy bluff and by the island of Kalampunian off it. It is backed by hills over 700 feet high. Kalampunian Island, ¾ mile northward of Sampanmangio Point, is a small wedge-shaped sandstone island that rises abruptly from a flat to a height of 40 feet. It is covered with bushes.

From Sampanmangio Point the coast trends southeastward for 7 miles to Point Aru, thence more nearly southward to Kudat. It is lined by nearly continuous beaches. Behind the stretch of beach south of the Agong Agong River there is a strip of swampy land. Dense undergrowth of casuarina trees lines the beaches, and jungle covers the inland area. About ½ mile from the shore the ground rises gradually and forms a ridge a mile inland.

Behind the beach north of Point Kapor, upon which stands Target Rock, 30 feet high, is a coast road about 100 yards inland. Between the road and the beach is a coconut grove, which is swampy during heavy rains, but never impassable. About 1,000 yards directly inland from the beach north of Point Kapor there is a swampy area interspersed with small areas of higher ground extending inland for 3 miles.

Kudat Harbor is about 4 miles long and is 1⅓ miles wide in the entrance between Point Bornugus and Cape Tigasamil. Two and one-half miles within the entrance, the width decreases to 1,100 yards. The head of Kudat Bay expands into 3 shallow bays, into the southernmost of which flows the Tegarangan River. Except for a low, marshy plain extending about 3 miles north and northwest of the town, Kudat Harbor is surrounded by hills 200-400 feet high (FIGURE IV - 251). The hills northwest of Egeria Bluff and Johnstone Bluff are composed chiefly of sandstone; their surfaces are sandy clay, slippery when wet. The coast west of Kudat Village and along the western end of the harbor is often flooded after rains. The swampy parts of the coastline are covered with dense mangrove and nipa palms.

The coast from Cape Tigasamil to Pulo Melau forms a small bay. The coast is composed of steep slopes, but near the high water line there is a narrow flat covered with casuarina trees. The ground inland rises gradually to a series of broken hills, none of which are over 600 feet high 1 mile inland.

FIGURE IV - 251. *Northeast Borneo, Marudu Bay area.*
Kudat and Bornugus Point in center, Kudat Harbor in left background. S end of 14-mile beach at right. Distant shores are mangrove covered. Looking westward.

(*b*) *Eastern side.* Cape Mafsie, the eastern entrance point of Marudu Bay, is situated 100°, 11¾ miles from Point Aru. It is 56 feet high, with conspicuous white cliffs. A sharp rock 35 feet high and another rock 30 feet high lie close to it.

Point Perawan, about 2½ miles southward of Cape Mafsie, is 56 feet high, and is easily distinguished by its red cliffs. From this point the coast curves southeastward to the mouth of the Bengkoka River, forming a shallow bay, off the shore of which the sand dries ¼ to ¾ mile. Casuarina trees extend along the coast southward of Cape Mafsie. An underwater flat with depths of less than 3 fathoms extends 2¼ miles offshore between Point Perawan and Bengkoka River.

The entrance to Bengkoka River, the largest river in Marudu Bay, is 3½ miles southward of Point Perawan. About 800 yards wide at the mouth, the river rapidly decreases upstream to a uniform breadth of about 200 yards. It is obstructed by a large sand spit, which extends 1¾ miles from the shore on the northern side of the entrance. Bengkoka Islet, the tops of the trees on which are 25 feet high, lies on the southern side of the sand spit, nearly ¾ mile from its extremity. One and one-third miles upstream of Bengkoka Islet the river takes an abrupt turn to the southward, a branch continuing to the southeastward.

The coast from Bengkoka River to a rounded point abreast Zebra Reefs is sandy and fringed with high casuarina trees, and is fronted by shoal water extending ¾ mile to 1¼ miles from the shore. Between this point and another, 2¾ miles southward, the coast recedes 1 mile southeastward, forming a bay, the shores of which are intersected by streams and mangroves, the hills at the back sloping gradually to the sea. The shore of the bay is fronted by a bank of sand and coral to a distance of ½ mile, in places.

The mouth of the Tenga River adjoins that of the Bengkoka, being 1⅓ miles southwestward from Bengkoka Islet. The

Tenga is a distributary branch of the Bengkoka River. It flows into the bay between 2 sand spits which extend ⅔ mile from the shore. The depth on the bar between these spits is 1 foot.

The entrance to the Taka River is situated 3½ miles southward of the entrance to the Tenga River. The western side of the entrance channel is formed by a sand spit which projects northward for more than 1 mile. The bar of the river, off the extremity of the sand spit, has less than 2 feet on it at low water springs and generally breaks.

A cutch factory, the chimney of which is 90 feet high and forms a conspicuous landmark, is situated about 3¼ miles south of Zebra Reefs, and near Mempakad village.

Ridge Point lies 3½ miles 240° from the cutch factory. The shore between is fringed with a reef of sand and coral, which extends northward for about 1 mile from Ridge Point.

There are almost continuous beaches from a point 1 mile north of Cape Mafsie southward to the vicinity of Zebra Reefs.

(3) Anchorages.

Anchorage may be obtained in depths of 5 to 10 fathoms, muddy bottom, almost anywhere toward the sides of Marudu Bay.

Anchorage off the coast north of Kudat Harbor can be found within the 10-fathom curve over a coral and mud bottom. The water often is muddy near the coast.

For anchorages in Kudat Harbor, see Chapter VI.

Anchorage can be found in 9 to 10 fathoms over mud bottom off the coast between Cape Tigasamil and Pulo Melau. The water here is often muddy.

(4) Dangers to navigation.

Several shoal spots are located off the entrance to Kudat Harbor; most conspicuous is Sandilands Rock on which a light was located. Parts of the rock have depths of 1¾ fathoms and nearby there are depths from 6 to 8 fathoms. North of this patch are Witti Rocks which have depths of 3 to 4 fathoms over them. For other dangers in the harbor, see Chapter VI.

The edge of the fringing reef is rocky. Off both Cape Tigasamil and Pulo Melau the reef projects for a greater distance than off other parts of this coast. No dangers exist beyond 1 mile offshore. The east coast is comparatively free from dangers. About ¼ mile off the mouth of the Taka River are 2 patches of 1½ and 3 fathoms, respectively. Nearly 3 miles farther south and 2 mile offshore lie the Zebra Reefs, coral patches separated by deep water, and with deep water between them and the shore.

(5) Landing beaches.

(a) Sampanmangio Point—Kudat beach. (PLANS 39 and 42, Section B(a); FIGURES IV - 251 and IV - 252) Reliability FAIR.

1. Location and extent. A 14-mile-long beach borders the northwestern shore of Marudu Bay from Sampanmangio Point to the village of Kudat (FIGURES IV - 251 and IV - 252). The limits of the beach are at 7° 02′ 20″ N, 116° 44′ 10″ E, and 6° 52′ 55″ N, 116° 50′ 58″ E.

2. Nearshore. The offshore conditions are similar along the length of the beach. The 30-foot line lies 1,000 to 2,000 feet offshore except near Kudat where it is about 3,000 feet. The bottom slope is gentle to the edge of the drying reef; but in places the 30-foot line lies at the reef edge. The bottom is coral mud, soft sand, or coral rock. Off-lying dangers within the 30-foot line are almost completely lacking. The beach faces northeast and is exposed to monsoonal winds from that direction during the period October to April. During northeasterly gales there may be moderate to heavy surf on the reef edge. From April to October winds are light, and the beach is well protected. Tidal range is about 5 feet; currents are probably negligible. The beach is fronted by a continuous fringing reef, which averages about 800 feet wide. The narrowest part is 400 feet, north and south of Point Aru, and 1½ miles north of Point Kapor the reef is 1,500 feet wide. From 2,000 feet wide at Point Kapor it increases to 3,000 feet east of Kudat. Most of the reef barely dries at low water, but isolated, widely separated patches dry 3 or 4 feet. The wider reefs are partly covered with coral sand.

FIGURE IV - 252. *Northeast Borneo, Marudu Bay area.*
Town of Kudat at left, Bornugus Point in center foreground. Dotted pattern shows approximate extent of beach. Two piers at right are probably for very small boats, principal piers are at left. Dark, patchy area in foreground is coral reef.

3. Character of beach. The beach itself is sand or coral sand; coral sand probably predominates except where hills approach the shore closely. The beach has but few interruptions, none of them of great extent. From 3,000 to 5,000 feet south of Sampanmangio Point there is a low rock cliff, and 8,000 feet south of the Point the beach is crossed by a stream which cannot be waded. Two miles north of Point Aru a stream of similar size crosses the beach, and from ½ to ¾ mile below the point the beach may be soft near the mouths of several small streams. From here to Kudat only small, widely spaced streams cross the beach.

4. Adjacent terrain and exits. Over the greater part of its extent the beach is backed by a narrow coastal lowland 1,000 to 2,000 feet wide, behind which are rolling hills 200 to 500 feet high. For about 4 miles north of Kudat the country inland is low and in places marshy. South of Point Aru a road follows the coastal lowland, generally within 1,000 to 2,000 feet of the beach. This road leads to Kudat; about 1½ miles north of the city it connects with a road leading west across the peninsula to Sikuati (Sequati) on the west coast. Telegraph, cable, wireless, potable water, and other facilities are to be found at Kudat.

(b) Sikuati beach. (PLANS 39 and 42, Section B(b)) Reliability POOR. A beach 7 miles long, on the South China Sea coast of Borneo, is connected with Kudat and the Marudu Bay area by road. The beach extends from 6° 57′ 05″ N, 116°

42′ 40″ E, to 6° 52′ 20″ N, 116° 39′ 30″ E. Opposite the northern half, the 30-foot line lies about 1 mile offshore, and there are numerous off-lying dangers. Along the southern portion, the 30-foot line is about 1,500 feet from the beach and the approach is clear. From November to April winds are from the north, and there is often heavy surf. From April to November winds are southerly, and the beach is partly protected, but moderate to heavy surf may be expected.

The beach is composed of firm sand and has a moderate slope. It is interrupted in the southern part by short stretches of sandstone cliffs, either red or white, which serve as markers. The Kudat road ends at the village of Sikuati (Sequati) on the southern part of the beach (village not marked on most maps and charts). The country between the beach and Kudat is gently rolling and not densely wooded. It could probably be crossed readily by infantry and motorized equipment. The road, about 15 miles long, is reported unimproved, but may be passable for wheeled vehicles.

(*c*) *Kudat Residency beach.* (PLAN 42, Section B(c)) Reliability POOR. A beach 2,000 feet long borders the northwest-trending shore beginning about 2,300 feet west of the piers at Kudat. A cliff west of the residency marks its southern end. The limits are at 6° 53′ 16″ N, 116° 50′ 23″ E, and 6° 52′ 58″ N, 116° 50′ 27″ E. The beach faces the shallow part of Kudat harbor and is completely protected from all winds. The maximum depth directly off the beach is 15 feet; to the south, depths of 25 feet are found, all over mud bottom. From 15 feet the bottom shoals gently to a drying mud flat 750 feet wide; the flat is probably not passable at low water. The beach is fine sand and mud and is backed by a narrow belt of mangrove and then swampy terrain. The area behind the beach has been used as a rifle range and is probably passable for infantry. A road lies 800 feet behind the beach from which exits are numerous except to the north, were low, mangrove-covered flats limit the beach.

(*d*) *Tigasamil Peninsula beaches, and southward.* (PLAN 42, Section B(d)) Reliability POOR.

1. Location and extent. Discontinuous stretches of beach fronted by coral reef and totaling about 8,500 feet in length, border the north and south side of Tigasamil Peninsula, on the south side of Kudat harbor. The extreme limits are at 5° 51′ 47″ N, 116° 50′ 02″ E, and 5° 51′ 06″ N, 116° 50′ 57″ E.

2. Nearshore. With the exception of a 3,000-foot spit extending northeast from Cape Tigasamil, the offshore approach is clear to the reef edge. Generally, depths of 15 to 30 feet are found close up to the reef. The beach is exposed to northeast winds from October to April; surf may be moderate to heavy. Tidal range is about 5 feet.

3. Character of beach. The beach stretches are sand and coral sand; the interruptions are low rock cliffs or low wooded shore. Fronting the total length is drying coral reef averaging about 1,000 feet in width. Beginning at the northwestern limit, measurements are as follows: beach, 2,400 feet; interruption, 1,650 feet; beach, 700 feet; interruption, 1,000 feet; beach, 500 feet; interruption, 1,500 feet; beach, rounding the cape, about 2,500 feet; interruption, 1,300 feet; beach, 2,400 feet. The last stretch, southwest of the cape, is partly built up with native houses. This is the narrowest part of the reef, and this section appears to be the most favorable for landing. The first high hill west of the cape (elevation 253 feet) serves as a marker for this stretch.

4. Adjacent terrain and exits. A trail leads south around the head of Marudu Bay from 2 miles west of Cape Tigasamil; the trail is nowhere more than about 1 mile from any of the beach stretches. There is no information concerning water supply or other facilities on this peninsula; Kudat is about 1½ miles away, across the harbor.

South of Cape Tigasamil peninsula, on the west side of Marudu Bay, are beaches, usually less than 1 mile long, which are not described in detail. These beaches are near Pulo Melau, Pirate Point, and about 3 miles south of Pirate Point. Exit from the beaches is generally difficult because of flanking, mangrove-lined streams and high, wooded hills between the beach and trail leading south from Kudat harbor.

(*e*) *East shore Marudu Bay beaches.* (PLANS 39 and 42, Section B(e)) Reliability POOR. An almost continuous beach borders the eastern shore of Marudu Bay for 15 miles from 6° 57′ 10″ N, 117° 02′ 10″ E, to 6° 43′ 55″ N, 116° 58′ 50″ E. The northern part of the beach faces Kudat harbor, 12 miles to the west. Except at the extreme southern end the 30-foot depth line is nowhere less than 1 mile from the beach, and in the central portion it is 3 miles offshore. The mud and sand bottom slopes very gently; off-lying dangers are almost completely lacking. The beach is fairly well protected from winds; from November to April northerly winds may cause low to moderate surf. The tidal range is about 5 feet. Five miles of the beach at the north end are fronted by drying reef; the reef is more than 1 mile wide in the north, and gradually decreases in width to Point Perawan. About 1 mile south of this point it disappears, and is replaced by a sand and mud tidal flat. For 4 miles south of Point Perawan the flat is more than 1 mile wide. Farther south it averages about 1,500 feet in width. It is probably not passable at low tide. The beach is sand, and in the northern 5 miles is partly coral sand. The white cliffs at Cape Mafsie and the red cliffs at Point Perawan interrupt the beach for about ½ mile each. Three rivers, too deep to wade, cross the beach; 2 of them are in the central part and the third is about 2½ miles from the southern end. Casuarina trees are the dominant vegetation just behind the beach throughout most of its extent. The country back of the beach is low, densely wooded, and in part swampy. There are native villages up the larger rivers; otherwise, information is lacking as to routes of communication or other facilities.

Farther south along the east side of Marudu Bay are a number of beaches not described in detail. Conditions are much as described above except that these southern beaches are on or near a trail running from Pitas (5 miles inland, on the Bengkoka River) to Mempakad, and thence southwestward to the head of the Bay.

C. Sandakan Harbor Area.

Cape Pandaras to the mouth of the Mamuyon River. (PLANS 39 and 43; FIGURES IV - 253 to IV - 259)

(1) Offshore zone.

From Cape Pandaras southward to Papat Point, shallow depths are found for a distance of several miles offshore, except off the entrance to Sandakan Harbor. Within the 5-fathom curve which passes 5 to 8 miles out, the depths decrease uniformly to the shore. The 10-fathom curve passes 10 miles to the northeastward. Several rocks and rocky islands exist offshore, as the one north of Cape Pandaras and the one just east of the unnamed point 4 miles southeast of Cape Pandaras. A fringing reef vary-

ing from ¼ mile to 1 mile extends along the coast to Nunuyon Derat island.

For the offshore zone in Sandakan Harbor, see Chapter VI.

From Aru Point eastward to the Mamuyon River the 5-fathom curve passes 8 miles out. Depths inside the 5-fathom curve vary uniformly over a mud, or sand and mud bottom to the alluvial shore.

(2) Coastal topography.

The northern part of Sandakan Harbor is formed by steep hills. About 1½ miles west of the town, hills attain heights of 850 feet. Berhala Island, at the entrance to the harbor, has at its southern end 2 hills over 500 feet high, which are cliffed on the east (FIGURES IV - 253 and IV - 256 to IV - 258). The northern part of Berhala Island is low. Coalescing deltas of many streams are built into Sandakan Harbor forming its western and southern parts. Near stream mouths deltas are fringed with sandy beaches; elsewhere soft mud flats are found. Immense swamps extend many miles inland. Extensive low plains separate swamps from interior ranges, though a few isolated hills rise abruptly from swamps and plains. Swamps have standing water and deep mud, but inner parts above tidal limits are passable along natural levees bordering streams. Native trails follow ridges through the swamps. Swamps have dense mangrove and nipa. Plains are largely virgin rain forest except near Sandakan where much of the land is in tobacco and rubber plantations and there are large areas of dense brush and second-growth jungle. Hills are generally densely wooded.

Sandakan Harbor is 1¼ miles wide at the entrance between Berhala Island and Aru Point, the broad point opposite, to the southeast. From here it gradually increases in width, forming, north of Pulau Bai, a spacious basin more than 3 miles in diameter, which constitutes the usual anchorage.

The harbor extends southward and westward of Pulau Bai to a distance of 15 miles from the entrance, but the only part surveyed is that north of Pulau Bai and Sapagaya Bay, situated on the southern shore. From the entrance to the end of Sandakan Bay the depths vary from 3 to 16 fathoms. Some 13 rivers empty into the bay.

The eastern side of the harbor entrance is formed by a large island, low, densely wooded, and separated from the main coast by Trusan Duyon channel. From the shore eastward of the entrance, and projecting seaward, is an extensive flat, the northern point of which, in a depth of 3 fathoms lies 7 miles northeast of Aru Point. The 5-fathom limit is 2 miles farther out.

The northern shore of Sandakan Harbor rises to many summits conspicuous from seaward, of which the highest and centermost is Bukit Mekarah (Three-peaked Hill), 850 feet high. These hills slope gradually on their northern and western sides, and are generally steep on their southern and eastern sides. Other landmarks are the jail, which is white with a red roof, and a flagstaff westward of it. In the center of the town of Sandakan, near the government offices, is a conspicuous white clock tower. (FIGURES IV - 254 and IV - 255)

(3) Anchorages.

For anchorages in Sandakan Harbor, see Chapter VI.

(4) Dangers to navigation.

A bar of mud about 3¼ miles across, within the 5-fathom curve, lies from 6 to 9½ miles northeastward of the southern point of Berhala Island. The least charted depth on the track over the bar is 4 fathoms at low water, but nothing less than 5 fathoms has been reported.

On 22 March 1931, the *S.S. FRANCONIA* of the Cunard Line, drawing 26 feet, entered the port at high water spring tide.

Atjeh Rock, with 2¼ fathoms at low water, and the only detached danger off the town of Sandakan, lies 700 yards 100° from the eastern extremity of the Government pier.

A shoal of 2½ fathoms lies 1½ miles 290° from Pulau Palak, a 145-foot summit westward from Pulau Bai.

Allard Bank nearly fills the bight between the Government Pier and Pavitt Point, leaving a small pocket at its eastern end, where the depth is 2½ fathoms at low water.

Elton Bank is an extensive area of shallow water extending from the north shore of Pulau Bai for a distance of nearly 2 miles.

A white tripod beacon, 20 feet high, with a black conical top mark, was erected on a rock 2 feet high near the eastern extremity of the rocks bordering the channel, which extend 400 yards eastward of Pulau Bai.

Borneo Rock, beyond which the channel eastward of Pulau Bai has not been surveyed, has a depth of 4 feet of water and lies 1,200 yards 266° from the western extremity of Tigawis Island, in the fairway southward from Sandakan Harbor. It was marked by a red can buoy. The best channel is close westward of the rock.

(5) Landing beaches.

(a) Northwest of Sandakan, beach. (PLAN 43, Section C(a)) Reliability POOR. An 8-mile stretch of beach, broken by 1 mile of mangrove-covered lowland, borders the coast about 8 to 14 miles northwest of Sandakan. The limits of the beach are 6° 02′ 15″ N, 118° 02′ 35″ E, and 5° 56′ 45″ N, 118° 04′

FIGURE IV - 253. *Northeast Borneo, Sandakan Harbor area.*
Berhala Island, N of Sandakan Harbor, looking W. Details are shown in FIGURES IV - 256 to IV - 258.

10″ E. Except at the north end, where there are patches of drying coral 2 miles from the beach, the offshore approach is clear. The 30-foot line is about 5 miles from the shore, and the mud bottom slopes gently and uniformly. Winds are from the east and north, October to April, from the east and south, April to October. In the former period there may be several successive days with winds of moderate gale strength; waves may be high. Currents follow the winds, reaching a maximum of 1 knot from October to April.

The beach is fronted by a coral reef which is on the average 1,000 to 1,500 feet wide; at the north and south ends it is 1 mile wide. The beach is coral sand and coral debris. The northern 1¾ miles is separated from the rest of the beach by a 1-mile-wide mangrove swamp. There are probably several streams crossing the beach, but no information is available. Local use of the beach is indicated by a trail about 1 mile from the south end. The trail crosses the Sabine River about 3 miles from its mouth, and about 5 miles from the beach joins a road to Sandakan. The country behind and flanking the beach is low and densely wooded.

(*b*) *Berhala Island, northeast beach.* (PLAN 43, Section C(b)) Reliability POOR. On Berhala (Island), at the entrance to Sandakan Harbor, a beach 1½ miles long borders the northeastern shore. The beach limits are at 5° 53′ 30″ N, 118° 08′ 30″ E, and 5° 52′ 20″ N, 118° 09′ 00″ E. In the south the 30-foot line lies about ½ mile offshore; to the north the distance increases to 2½ miles. The offshore approach to the northern third of the beach is clear; to the south, off-lying patches of reef about 1,000 feet from shore partly block the approach. From October to April winds are from the east and north; moderate gales of several days' duration may be expected during this period. From April to October light winds blow from the south and east.

The northern half of the beach is fronted by a narrow, drying coral reef; here the beach is mixed sand and coral sand. The southern half is sand. The beach ends in the south at the cliffs of a 591-foot hill; in this part the country behind the beach has steep slopes and is heavily wooded. The central part of the beach is backed by a small area of mangrove. In the north the country is low and sandy. The northern half of the beach is nowhere more than 1,000 feet from another beach on the northwest shore of Berhala, and passage from one to the other should be easy. No exits to the southern, inhabited part of the island are known, but it is probable that trails run southward either from this beach or from the one on the northwestern

FIGURE IV - 254. *Northeast Borneo, Sandakan Harbor area.*
Coast at entrance to harbor.

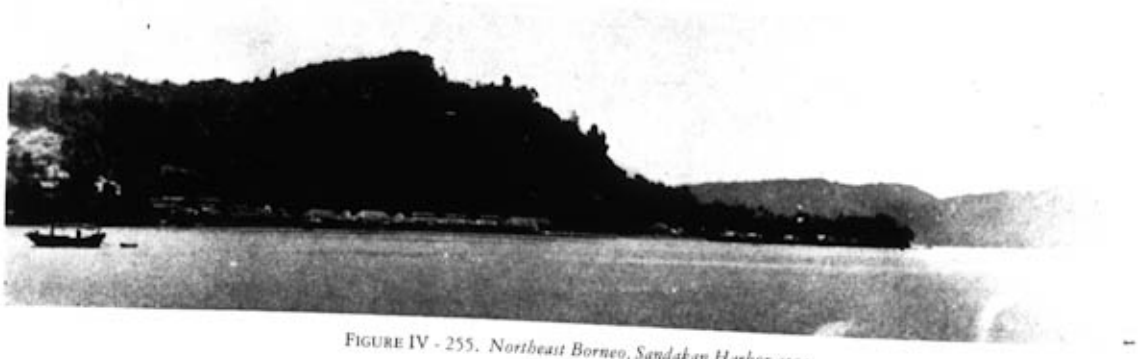


FIGURE IV - 255. *Northeast Borneo, Sandakan Harbor area.*
Looking NE.

shore. Potable water can be obtained from the leper colony and quarantine station about 1 mile to the south.

(c) *Berhala Island, east central beach.* (PLAN 43, Section C(c); FIGURE IV - 256) Reliability FAIR. A beach about 1,000 feet long borders the easternmost part of Berhala (Island). Its limit are at 5° 52′ 08″ N, 118° 09′ 05″ E and 5° 51′ 55″ N, 118° 09′ 02″ E. The northern 800 feet form a bight gently concave toward the east, the southern 600 feet 2 small bights concave toward the southeast. The quarantine station is on the southernmost of the 2 rocky headlands that separate the 3 bights (FIGURE IV - 256). The offshore approach is clear, the 30-foot line lying about 1,000 feet offshore in the north and 500 feet in the south. North and east winds blow from October to April, sometimes with moderate gale force. From April to October there are light winds from the east and south.

The northern bight of the beach is sandy and is fronted by a sandy tidal flat about 100 feet wide. At the north it ends at a rocky, cliffed section; at the south end it is separated from the next bight by a headland which forms the easternmost point of Berhala (Island). The beach in the 2 southern bights is sand mixed with pebbles and cobbles; the width is 20 to 30 feet and the slope is gentle in the center of the bight to moderate at the headlands (FIGURE IV - 256). There are 2 small pile piers in the southernmost bight. During strong easterly winds there may be moderate surf along all parts of the beach. Inland the surface rises steeply, and there is a dense forest cover. There is probably a trail leading to the leper colony and beach to the south, and thence to the beach on the west side of the island.

(d) *Berhala Island, southeast beach.* (PLAN 43, Section C(d); FIGURES IV - 257 and IV - 258) Reliability FAIR. A 1,500-foot pocket beach on the southeast side of Berhala (Island) at the entrance to Sandakan Harbor runs from 5° 51′ 50″ N, 118° 08′ 58″ E to 5° 51′ 35″ N, 118° 08′ 52″ E. The buildings of a leper colony stand just back of the central part of the beach; to the southwest are high, white sandstone cliffs (FIGURES IV - 257 and IV - 258). The 30-foot depth line lies about 600 feet offshore at the north end, and about 400 feet at the south end. For that part of the beach shown in Figure IV - 258 the offshore approach is clear, and the bottom slopes gradually. Offshore from that part of the beach, north of the small pier, there is an abrupt rise from the 30-foot depth to depths of about 4 to 6 feet and a number of small rocky shoals partly obstruct the approach. During easterly winds, October to April, there may be low or moderate surf on the beach.

The beach is about 20 to 50 feet wide, and is sandy, firm, and gently sloping. There are no interruptions to its continuity and any part is suitable for landing; the southern part, because of more favorable offshore conditions, is to be preferred. Steep cliffs are a barrier to movement to the southwest (FIGURES IV - 253, IV - 257, and IV - 258). To the northwest, a trail leads to the built-up area behind a beach on the west side of the island (FIGURE IV - 257). There is probably a trail leading over the rough hilly country to the beach to the northeast (quarantine station).

(e) *Berhala Island, west beach.* (PLAN 43, Section C(e)) Reliability POOR. A 700-foot long beach on the west side of Berhala Island extends from 5° 52′ 03″ N, 118° 08′ 35″ E to 5° 51′ 57″ N, 118° 08′ 32″ E. The beach lies at the end of a ¾-mile-long cliff which is continuous from the southern tip of the island. The 30-foot line lies about 500 feet offshore; the bottom slopes gently, and the approach is clear. A sandy tidal flat, 200 feet wide, dries at low water. The beach is protected from

FIGURE IV - 256. *Northeast Borneo, Sandakan Harbor area.*
Berhala Island, E shore, quarantine station on projection between 2 stretches of beach. From far left to center is sandy beach, with increasing admixture of coarse material and increasing slope. From center to near right margin is mostly low, rocky cliff, broken by small patch of beach. At far right, is beginning of beach in next bight. At far left is part of white cliff shown in FIGURE IV - 257.

FIGURE IV - 257. *Northeast Borneo, Sandakan Harbor area.*
Beach on SE side of Berhala Island, looking northwestward. Leper colony in foreground. Buildings in right background are behind beach on W side of island.

FIGURE IV - 258. *Northeast Borneo, Sandakan Harbor area.*
Red cliffs on E side of Berhala Island at S end of beach shown in FIGURE IV - 257. The 8 small houses and pier at far right of this view are in left center of FIGURE IV - 257.

all winds; waves and surf are negligible. The beach is sand and gently sloping. The sand tidal flat fronting it is probably firm enough for walking. To the south, where the beach ends against rocky cliffs, exit is possible along the top of the cliffs. To the north, a stream and a mangrove area about 500 feet wide limit exit. A trail leads across the island to the beach on the southeast side.

(*f*) *Berhala Island, northwest beach.* (PLAN 43, Section C(f)) Reliability POOR. A beach nearly 1 mile long on the northwest shore of Berhala Island extends from 5° 53′ 28″ N, 118° 08′ 30″ E, to 5° 52′ 50″ N, 118° 08′ 32″ E. The beach faces Shallow Bay; the northern half is convex, and the southern half is a concave pocket beach. The beach is essentially a continuation of the one on the northeast side of the island. The 30-foot line lies approximately 1 mile offshore and the approach is clear. The beach is sand; in the northern part it is fronted by a narrow coral reef and a narrow, drying sand tidal flat. Opposite the concave, southern part of the beach the tidal flat is about 2,000 feet wide. This flat may be firm enough for walking. Over much of its length the beach is no more than a few hundred feet from the beach on the northeast side of the island. Information as to other exits is lacking.

(*g*) *Shallow Bay beach.* (PLAN 43, Section C(g)) Reliability POOR. A beach about 1½ miles long borders the northeast shore of Sandakan Peninsula. The beach, which is west of the southern half of Berhala Island, and facing Shallow Bay, extends from 5° 52′ 08″ N, 118° 06′ 54″ E, to 5° 51′ 25″ N, 118° 07′ 42″ E. Parts of the beach are straight, others are sinuous in outline. The beach is well protected from all winds. The tidal range is about 8 feet. The 30-foot line is about 1 mile offshore; from this depth there is a slope of 1 on 15 to 1 on 50 to depths of 1 or 2 feet. A sand tidal flat, ½ to ¾ mile wide, dries in patches at low water. Within 1,000 feet of the beach there are rocky drying patches; these are more common opposite the headlands, but may extend outward for a few hundred feet from pocket beaches. Between the northern headland and the next prominent headland (about 2,000 feet to the south) there is a stretch of sand beach; elsewhere the beach is made up of boulders and blocks, and is steep and narrow. The beach is backed by a strip of low, wooded country 300 to 500 feet wide; beyond, the surface slopes steeply to hills 200 to 400 feet high. To the north and south the beach is bounded by mangrove swamps; the southern mangrove area is by-passed by a trail leading to the beach east of Sandakan.

(*h*) *Papat Point beach.* (PLAN 43, Section C(h); FIGURE IV - 259) Reliability FAIR. East from the city of Sandakan a beach borders the shore for a little more than 1 mile. Its limits are 5° 51′ 08″ N, 118° 07′ 52″ E, and 5° 50′ 27″ N, 118° 07′ 20″ E. Opposite the northern part of the beach the 30-foot line is about 2,000 feet offshore; there is a moderately steep slope to depths of 5 to 10 feet about 1,500 feet from the beach, and from there the sandy bottom slopes gradually to a drying sand tidal flat about 800 feet wide. The approach in this section is clear. Southwest of Papat Point the 30-foot line lies about 700 feet offshore; in places there is a steep bottom slope, in others it is gradual to the beach. Several drying rock shoals partly block the approach; these lie not far outside a drying sand tidal flat, which on the average is about 200 feet wide. The tidal range is about 8 feet; maximum currents of 1¼ knots (flood) and 2 knots (ebb) may be encountered. Waves and surf are negligible except during strong blows from the northeast.

For 2,000 feet at the northern end, the beach is sand and pebbles and in part is built-up. For several hundred feet at the north, and also near Papat Point the nearshore part of the tidal flat is covered with rocky patches. For 1,000 feet from Papat Point the beach is pebbles and boulders; the rest of this part of the beach, as far as the small rocky headland about 300 feet south of several piers, is sand beach. The tidal flat here is in part covered with boulders. Continuing to the southwest, there is an interruption about 800 feet long, and then an 800-foot stretch of sand beach, which lies between a small rocky headland and bulkhead shore near the jail. In this section, native houses are built out on the tidal flat. The beach east of Sandakan is backed by a generally narrow coastal lowland, which is either built-up or is planted to coconut palms (FIGURE IV - 259). A road from Sandakan follows close to the beach for much of its length. At the northern end of the beach there is a trail leading to the beach on the northeast shore of Sandakan peninsula.

(*i*) *Sandakan beach.* (PLAN 43, Section C(i)) Reliability FAIR. A beach nearly 2 miles long extends along the shore west of Sandakan. The beach begins about 1,800 feet east of the customs and harbor office; its limits are 5° 50′ 17″ N, 118° 06′ 49″ E, and 5° 49′ 50″ N, 118° 05′ 25″ E. The tidal range is about 8 feet; protection from all except strong northeast winds is good. At the east end of the beach the 30-foot line lies about 1,000 feet offshore; the distance increases gradually to a maximum of 1 mile at the west end. The bottom slopes gently and uniformly except for the eastern extension of Allard Bank, over which depths of 1 to 2 feet are found. The offshore approach is clear of obstructions.

The beach is sand, and mud, and is uninterrupted except for 2 streams in the central part. A sand or mud tidal flat averaging 200 to 300 feet wide is present at most places. Near the eastern end, the beach and flat are extensively built-up and farther west a number of piers are built out to depths of 8 to 15 feet. Behind the beach is a low coastal strip about 500 feet wide backed by a steep slope to hills 200 to 500 feet high. A road from Sandakan follows the lowland. Sandakan has an ample supply of pure drinking water and other facilities.

(*j*) *Allard Bank beach.* (PLAN 43, Section C(j)) Reliability POOR. A beach 1 mile long, facing east over Sandakan Harbor, extends from 5° 49′ 32″ N, 118° 05′ 02″ E, to 5° 48′ 40″ N, 118° 04′ 48″ E. This beach is separated from the one west of Sandakan by a ½-mile stretch of low, mangrove-covered shore. The 30-foot line, which in the north is about 1¼ miles offshore, approaches the beach and lies about ¼ mile offshore at the south end. Fronting the beach, Allard Bank, a shoal with depths of 1 to 2 feet, mud bottom, is correspondingly wide in the north and narrow to the south. Tidal range is about 8 feet, and the beach area is well protected from all except strong northeast winds. The beach is fronted by a sand tidal flat averaging about 300 feet in width; opposite the 3 short stretches of low, rocky cliff, the tidal flat is covered with boulders and blocks.

The beach is sand, and is not interrupted except for a few small streams, which can probably be waded, and the cliffs mentioned above. The centers of the cliff sections are approximately 1,500 and 2,300 feet from the south end, and 1,500 feet from the north end. Parts of the beach and tidal flat are built-up with native houses. Behind the beach is a narrow coastal lowland and then a steep slope to hills 300 to 500 feet high. A trail connecting with the road from Sandakan runs behind and close to

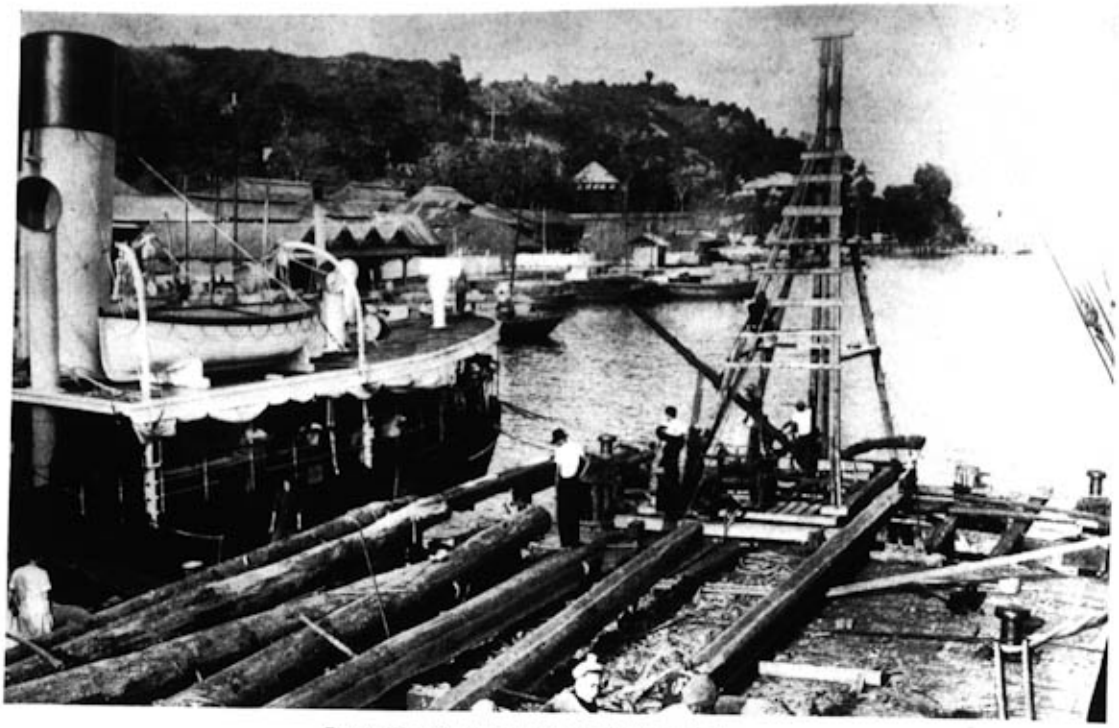


FIGURE IV - 259. *Northeast Borneo, Sandakan Harbor area.*
Wharf and harbor at Sandakan, looking eastward. Both E and W of Sandakan, beach is backed by very narrow lowland, most of which a built up, and then by steeply sloping hills 200 to 500 feet high.

the northern 2,000 feet of beach. To the south the beach is flanked by alternate stretches of mangrove and rocky cliffs.

(*k*) *Bai Island beach.* (PLAN 43, Section C(k)) Reliability POOR. A beach about 1¼ miles long on the north shore of Bai Island in Sandakan Harbor extends from 5° 47′ 02″ N, 118° 06′ 04″ E to 5° 46′ 46″ N, 118° 07′ 03″ E. The beach faces north-northeast toward the town of Sandakan, 4 miles away. The 30-foot line lies 1 mile offshore at the west end of the beach and 2 miles offshore at the east end. Inside this line is an extensive shoal (Elton Bank) with depths of 8 to 15 feet over mud bottom. The tide range is about 8 feet and the beach is protected from all but strong northeast winds. Within 2,000 to 2,500 feet of the beach are numerous drying reef patches; others are awash at high water. In general, the offshore approach is over foul ground.

The beach is fine sand and is continuous except for 1 stretch of mangrove, about 800 feet long, 1,000 feet from the eastern end of the beach. In the central part there are patches of mangrove 100 to 200 feet wide in front of the beach. Behind the beach the country is generally low and planted to coconut palms. Mangrove flanks the beach at both ends. There is no information as to drinking water, roads or trails, or other facilities. Probably all native travel is by boat.

(*l*) *Aru Point beach.* (PLAN 43, Section C(l)) Reliability POOR. A beach 3 miles long borders Aru Point, on an unnamed island at the east side of the entrance to Sandakan Harbor. This beach lies opposite and in sight of the beach east of Sandakan, and of the eastern beaches on Berhala (Island). The beach limits are 5° 51′ 10″ N, 118° 11′ 43″ E, and 5° 50′ 10″ N, 118° 09′ 42″ E. At the western end, the 30-foot line is about 2,000 feet offshore; toward the east it gradually leaves the shore, and at the eastern end of the beach is more than 1½ miles distant. At this end, bottom slopes are gentle; opposite the center of the beach and farther west there is a slope of 1 on 10 to 1 on 20 from the 30-foot depth to a sand tidal flat 1,000 feet wide. The offshore approach is clear. Tidal range is 8 feet, and the coast is exposed to easterly winds prevailing from October to April; during this time there may be moderate to heavy surf during storms.

The beach is sand and is continuous except for 1 stretch of low, swampy shore 2,000 to 3,000 feet from the southwestern end. Fish weirs constructed of stakes cross the tidal flat at intervals of 1,000 to 2,000 feet. Near the western end of the beach native houses are built on shore and on the tidal flat. This part of the beach is backed by lowland planted to coconut palms; farther east the shore is low and covered with casuarina trees and coarse grass. There are probably no roads or other facilities; travel to and from the island is by boat only.

D. Darvel Bay (Lahad Datu area).

(PLANS 39 and 44)

(1) Offshore zone.

From Labian Point westward along the north coast of Darvel Bay the area is clear of out-lying reefs except Howard Shoal. The 5-fathom curve parallels the coast about 1,000 yards out from Labian Point to Tangku Point. From this latter point west-southwestward deep water exists right up to the steep cliffy coast line to Bagahak Point. There is a considerable break in the fringing reef at Bagahak Point where a large unnamed river enters Darvel Bay. Soundings of 6 to 12 fathoms have been found

in this reef break. Other clear breaks are located along the coast with depths up to 5 fathoms westward as far as Kennedy Bay. From Bagahak Point the 5-fathom curve follows the reef edge closely through Kennedy Bay. The 5- and 10-fathom curves are about 400 yards apart and extend ½ to ¾ mile off the peninsula.

Northwestward of Melandong Point the 5-fathom curve parallels closely the 3-fathom shoal along the coast for about 3 miles. The 10-fathom curve passes from 1½ miles off Melandong Point to ¾ mile off the mouth of the Taganipa River. At Lahad Datu the 5-fathom curve passes about 800 yards off the village; the 10-fathom curve passes about 2 miles from the coast southeast of the village and very close to the northwestern shore of Sakar Island. There is deep water all along the coral-studded southeastern shoreline of Sakar Island.

To the west of Sakar Island, Darvel Bay is dotted with many small islands, which in part form Silam Harbor (PLAN 44). The Saddle Islands are a chain of 6 wooded islands extending ½ mile to 2¾ miles southeast by east from Pulau Bayan, immediately south of Silam. Sagai Island, the westernmost island, about 400 yards in diameter and 195 feet high, stands on a reef separated by a very narrow passage from the reef projecting from Sumabun Island, next to the southeast. The other 5 islands of the Saddle Islands rise from a common reef. From northwest to southeast these islands are Sumabun, Nipa Nipa, Tabauwan, a small unnamed island, and Giffard. Sumabun and Tabauwan, the largest, are each about 1,200 yards long and rise to summits of 280 and 305 feet, respectively.

Close eastward of Batu Point is Saranga Island, 900 yards long, north—south, consisting of 2 wooded hills joined by a narrow strip of mangroves. The island is fringed by a reef, which projects southward 400 yards from the south end. The passage between these islets and Batu Point is barred by a reef.

Baik Island, near the middle of Silam Harbor, is ¼ mile long, west-northwest—east-southeast, thickly wooded, with a remarkable conical summit 410 feet high near its eastern end, and is easily recognizable on approaching the harbor. There is very little reef off its southern and southeastern sides, but from its western point a tongue of reefs projects 700 yards northwestward. White rocks near the end of this reef show their heads 1 foot above high water.

Other islets and reefs off this part of the coast are described below under, (4) Dangers to navigation.

(2) Coastal topography.

Between Labian Point and Tunku Point the land rises gradually from the low sandy coast to a wooded ridge 400 to 500 feet high and about 1½ miles from the coast. The low sandy shore is backed by gradually rising land and hills for about 1 mile inland as far as the Sibet River. Tunku Point, located 24 miles on a bearing of 19° from the summit of Gaia Island, is low and rounded. A mud flat that dries projects nearly ½ mile from Tunku Point, and shoal water extends ¼ mile farther, dropping very suddenly to 14 fathoms. Westward of the point along the coast the land rises to the Bagahak Range with spurs which run down in steep slopes to the coast. Northward of Tunku Point and 1 to 2 miles inland there is a well-defined ridge of undulating hills 400 to 575 feet high. The Tunku River, which rises 12 miles northward of Tunku Point, flows through a gap in these hills, and enters the bay to the westward of the point. The entrance has only 1 to 2 feet of water over a bar at low water.

Bagahak Point, about 13 miles westward of Tunku Point, is a low mangrove point. A spur of the Bagahak Range, 520 feet high, runs southward to within a short distance of Bagahak Point. This spur forms a prominent point when viewed from the eastward or westward. Hill 950, located on the spur 1 mile inland, is an easily identified landmark from the east and west but not the south. For a distance of 4 miles to the eastward and 2 miles to the westward of Bagahak Point, the coast is fringed by coral reefs about ¾ mile in width. There are 3 narrow channels leading to the shore with depths of 5 to 10 fathoms. The edges of the reefs are steep-to. At Bagahak Point the mouth of the large unnamed river is swampy for 500 yards inland.

Westward for 3½ miles the coast is formed by the steep foothills of the Bagahak Range where numerous deep streams cut the coastline. Gradually decreasing cliffs form the coastline westward to Kennedy Bay. Low mangrove swamps border almost the entire coast of Kennedy Bay except for a short stretch of low cliffs on the eastern side of the bay. The inland terrain is mostly densely wooded lowland, with many fresh water swampy areas, which drain in the dry season.

Northwestward of Melandong Point, on the southern coast of Darvel Peninsula the coast is low and flat, fronted by mud flats and covered by trees, whose tops are 100 to 200 feet high. Deep mangrove creeks intersect the peninsula; none of these, however, were found actually to connect with the Silabukan River.

Seganen and Silibukan Rivers converge 1¼ miles within their common entrance on the northwest side of Darvel Peninsula. This entrance is nearly ½ mile wide at the mouth and may be recognized by a clump of trees 130 feet high on the northern point, somewhat higher than the dead level of the trees in the immediate neighborhood. Mud flats stretch off the southern entrance point.

From Lahad Datu a lowland corridor extends northward between low mountains to the broad alluvial valley of Segama, which cuts across Dent Peninsula to the north coast. From Lahad Datu a mangrove coast trends southward for 3 miles to the boat passage between Sakar Island and the mainland.

Sakar Island is only separated from the mainland to the westward by a narrow channel and is not recognizable as an island (FIGURES IV - 260 and IV - 261). It is 5 miles long east-northeast—west-southwest, with an extreme breadth of 2 miles, densely wooded, and it rises near the center in a conspicuous knob 735 feet high, visible over Darvel Peninsula. The southern shore is straight, but the north coast is deeply indented, narrowing the island in 2 places to a width of ½ mile, and there are some small islets close to the shore on that side. The northeastern extremity of Sakar Island runs down to a low point, from which a reef projects eastward for ¾ mile.

From Sakar Island the coast trends westward for 6 miles to Silam anchorage, with a few minor indentations. Near Silam, steep slopes border the coast.

Mount Mark rises to a well-defined summit 1,530 feet high at 1½ miles 328° from Silam, to which it sends down a long spur. It is readily recognizable, being the first summit showing on the sky line northeast of Mount Silam.

Mount Silam is a flat-topped wooded mountain 2,920 feet in height 2⅓ miles westward of Silam. It is altogether the highest mountain within many miles, and stands up boldly, being separated by a deep valley from the other mountains westward and southward of it, and falling steeply to the northeast; the ridge

FIGURE IV - 260. *Northeast Borneo, Darvel Bay area.*
Sakar Island, N Coast, looking westward. Fringing coral reefs show white. Note general absence of beaches. Beach S of Lahad Datu is at 1. Number 2 is same point as 2 in FIGURE IV - 261.

rising again to Mount Mark continues to the eastward as a coast range with a gradually diminishing altitude.

Batu Point, the southern point of Silam Harbor, is the eastern extremity of a low range of coast hills. The coast from Batu Point trends southwestward 3½ miles to Hastings Point, fronted by several small detached reefs extending to a distance of 1¾ to 2½ miles from the shore. This distance corresponds approximately with the 20-fathom curve of soundings. Hastings Point may be identified by a conspicuous little wooded knoll, 260 feet high, near its extremity. Some small detached reefs lie ½ mile eastward of the point. From Batu Point to Skertchley Point the coast is lined with narrow mangrove swamp backed by a dense jungle on the hills and mountain slopes.

The rivers Divatu, Magul, Sibahong, and Ladong discharge their waters into Lamak Bay, the coastline of which is fronted by extensive mud flats. These rivers are not sufficiently broad or deep to allow boats to ascend them for any considerable distance, and they cannot be entered at all except at high water.

Skertchley Point is a low mangrove point lying 2½ miles southward of Hastings Point. A spit of sand and mud, which dries, extends northeastward for ¾ mile from the point. The entrance to the Tingkayu River is immediately to the southward of the point. It is too shallow to admit boats.

(3) Anchorages.

A restricted anchorage can be found in Kennedy Bay in 7 to 11 fathoms over a mud bottom. Smaller anchorages could be used to the eastward in 7 to 15 fathoms over a coral bottom. Anchorage to the westward of Kennedy Bay can also be obtained in 7 to 10 fathoms about a mile off Darvel Peninsula.

For anchorage in the harbor of Lahad Datu, see Chapter VI.

The anchorage off Silam is on a very uneven bottom of sand and coral, and is encumbered by 3 small coral heads, with 4 fathoms over them, in the southern part of the anchorage, and a fourth coral head, Holmes Rock, with 3 fathoms on it, lying 1,450 yards, 47° from the western extremity of Sagai Island and 1,500 yards 129° from the end of the pier. A large ship should anchor outside these patches in a depth of 15 to 16 fathoms, but a moderate-sized vessel can anchor on the banks within them.

Southwest of Silam and to the north of Batu Point the coast forms a bight which affords sheltered anchorage in a depth of 8 to 10 fathoms over a mud bottom.

A good berth for a small vessel is with the northern extremity of Baik Island touching the south point of the southern islet off Sakar Island, 95°, which is a convenient mark to keep astern when nearing the anchorage. Anchor in a depth of 10 fathoms, sand and coral, when the eastern extremity of the southern part

FIGURE IV - 261. *Northwest Borneo, Darvel Bay area.*
Sakar Island, W end, looking westward toward village of Silam. Note absence of reefs and beaches. Number 1 is the approximate location of Silam village. Number 2 is same location as 2 in FIGURE IV - 260. Mount Silam is highest point on skyline.

of Saranga Island touches the western extremity of Sagai Island, bearing 199°. This berth just gives room to swing, and vessels can not approach nearer to the pier.

The edge of the reef off Silam is very irregular and broken into patches.

Lamak Bay, between Hastings and Skertchley Points, penetrates 1¼ miles to the westward and affords anchorage in 5 to 8 fathoms over mud bottom. The south and west sides of the bay are shoal, the 3-fathom curve being upwards of 1 mile from the shore, but the northwest corner is deeper.

(4) Dangers to navigation.

Howard Shoal, lying 2½ miles southeastward of Bagahak Point, is the main danger off the northeastern coast of Darvel Bay. It is a narrow coral shoal, with a least depth of 2¼ fathoms, 600 yards in length north-northwest—east-southeast, lying within the 5-fathom curve and rising abruptly from depths of over 20 fathoms.

Turner Patch is a small coral shoal, with 9 fathoms (and possibly less) on it, standing on the edge of the 20-fathom curve, 1¼ miles from the coast and 4⅝ miles 84° from Shoal Point.

A 4½-fathom shoal lies 3 miles east-southeastward of Shoal Point.

Armstrong Reef, a small coral reef, drying 5 feet at low water, with 6 to 7 fathoms around it lies 2¼ miles 286° from Melandong Point.

In the Harbor of Lahad Datu, bars at the mouths of streams prohibit entrance except of small boats at high tide. Detached reefs and foul ground extend off the greater portion of the coast near Lahad Datu to a distance of nearly 1 mile from the shore.

Crook Reef lies off the middle of the south coast of Sakar Island, 1 mile to the southward of the conspicuous knob. Some small islets lie ½ mile off the southwest end of Sakar. The southernmost of these islets has a sharp nipple 125 feet high at its southeast end.

A small island lies ½ mile westward from Crook Reef.

Kalung Kalungun is a small islet with a round top 145 feet high, 1¼ miles south-southeast from Baik Island. It stands on a reef which projects about 150 yards from the islet.

Misan Misan Reef, lying 1,800 yards 116° from Baik Island, is the southwesternmost of a line of reefs extending from Sakar Island; it is small, awash at low water, and occasionally difficult to distinguish. The passage between Misan Misan Reef and Kalung Kalungun is 1,600 yards wide.

Woodhall Reefs are 2 detached coral reefs which lie about ½ mile from the northern shore of Silam Harbor, and ¾ mile southeastward of Soai Soaiun Bay; they are together about ½ mile in length, west-northwest—east-southeast, 300 yards in width, and dry 1 foot at low water.

A narrow detached reef 350 yards long lies 400 yards north of the northeast point of Baik Island, and narrows the channel between it and the Woodhall Reefs to 600 yards.

Gusong Dilaut is a narrow reef 600 yards long, east—west, and awash at low water, lying 800 yards west of Kalung Kalungun, with a clear passage, between them.

Wanderer Reef, awash at low water, lying 1,700 yards 238° from Kalung Kalungun, is 800 yards in length north-northeast—south-southwest, and 300 yards wide.

Adams Reef, is a small reef lying 1,100 yards west-southwestward from the south end of Wanderer Reef, and 1,700 yards 174° from Giffard Islet. There is a small sand bank at its eastern extremity which dries 2 feet at low water, at which time the remaining part of the reef is awash.

Power Spit, a coral ledge extending in a northwest by north

direction for 700 yards from the northern extremity of Tabauwan Island, slightly obstructs the main channel between the Saddle Islands and Babi Island.

A small detached reef lies 700 yards eastward of Saranga Island.

Kiddle Reefs, 1⅓ miles south-southeastward from Batu Point, are 2 small reefs with some foul ground just north of them.

Moorhen Reefs are 4 small reefs, the southernmost of which lies 2¼ miles east-southeastward of Hastings Point.

(5) Landing beaches.

(a) Tungku beach. (PLAN 44, Section D(a)) Reliability POOR. The northern shore of Darvel Bay is bordered by beach from 5° 03′ 30″ N, 118° 59′ 30″ E to 4° 59′ 25″ N, 118° 49′ 00″ E. The beach is about 13 miles long; its western end is marked by spurs reaching the coast from the Bagahak Range.

The offshore approach is clear; the 30-foot line lies about ½ to 1 mile offshore and the bottom slope is gentle. A muddy bottom is found along the length of the beach. Winds are variable, but are common from the north and northwest; squalls, with wind force 3 to 5, are frequent during the summer months. Tidal currents of 1 knot set southwestward at flood, northeastward at ebb.

The beach is composed of fine sand and mud and has a gentle slope. Surf intensity is low except during easterly squalls, when there may be several lines of low surf. No groins or other structures cross the beach, which is interrupted, however, by 7 streams. The larger streams, except the one at Tolibas, are in the western 3 miles of the beach. The beach is fronted by a tidal flat on the average a few hundred feet wide; near Tungku Point the flat is more than ½ mile wide. The most favorable landing area appears to be that part of the beach from 2½ to 3½ miles from the eastern end, which is occupied by native houses. The streams at Tolibas and at Tungku Point are navigable for small boats; depths of about 1 to 2 feet across the bar at low tide can be expected. Landings on the banks of these streams, especially at the native villages a short distance upstream, may be more favorable than on the outer beach.

The beach is backed by flat or gently rolling land, which rises to a ridge 400 to 500 feet high about 1 to 1½ miles from the beach. Natives travel by boat; there is no information concerning trails or other facilities in this area.

(b) North shore Sakar Island beach. (PLAN 44, Section D(b); FIGURE IV - 260) Reliability FAIR. The north shore of Sakar Island is bordered by a 1-mile-long beach from 4° 59′ 35″ N, 118° 20′ 40″ E, to 4° 59′ 30″ N, 118° 19′ 50″ E. The beach is a little more than 2 miles east-southeast of, and in sight of the village of Lahad Datu.

The offshore approach is clear, over a gently sloping mud bottom. The 30-foot line lies more than a mile from shore. There is no current and the beach is completely protected from the generally light, variable winds. Mean high water springs are 2½ feet and mean high water neaps are ¾ foot above mean tide level.

The beach is gently sloping; of fine sand mixed with fine coral debris. The coral reef fronting the beach is about 200 to 400 feet wide and drops off sharply at the outer edge to depths of more than 20 feet. There are no streams or structures crossing the beach.

Inland, there is a flat area about ⅛ mile wide, and then the surface rises steeply to rolling hills 300 to 500 feet high. Most of the area behind the beach is densely wooded (FIGURE IV - 260). To the east the beach gives way to a reef, which continues on for several hundred feet and ends near a pinnacle of rock about 50 feet high. To the west, beyond the beach, there is a narrow coastal lowland, probably heavily wooded; the coastline is deeply indented. The nearest potable water and various facilities are at Lahad Datu, 2 miles to the north-northwest.

(c) Southwest shore Sakar Island beach. (PLAN 44, Section D(c)) Reliability POOR. A beach ½ mile long borders the southwest shore of Sakar Island. The beach lies just south of a conical 390-foot hill; this hill is 2¼ miles west of the 755-foot highest point of the island. The beach runs from 4° 57′ 10″ N, 118° 18′ 55″ E, to 4° 57′ 00″ N, 118° 18′ 30″ E. It is about 5 miles south of Lahad Datu and 8 miles east of Silam.

The offshore approach is clear from the south, but is partly blocked to the southeast and southwest by off-lying patches of coral reef. Depths of 50 to 70 feet are found near the edge of the fringing coral reef; the bottom is mud and fine coral debris. Currents up to 1 knot may be expected; the flood current is westerly and the ebb sets to the northeast. Waves are generally low except when caused by strong easterly winds during squalls.

The beach is gently sloping, narrow, and consists of fine sand, mud, and fine coral debris. It is fronted by coral reef a few hundred feet wide; during easterly winds there may be a line of low surf at the outer edge of the reef. There are a number of native houses on the beach, which is used as a landing place for small boats; no streams or structures cross the beach.

A few hundred feet behind the beach the surface slopes upward at 1 on 10 to a 390-foot conical hill. To the east the beach gives way to a steep coastal cliff; to the west there is lowland, probably heavily wooded. There is no good exit, except by water, to Lahad Datu or to the mainland in general. At Lahad Datu are the nearest telephone, telegraph, and wireless, as well as the only considerable supply of potable (but impure) water.

(d) Lahad Datu beach. (PLAN 44, Section D(d); FIGURE IV - 262) Reliability FAIR. A beach 1 mile long at Lahad Datu runs from 5° 01′ 35″ N, 118° 20′ 00″ E to 5° 01′ 10″ N, 118° 19′ 10″ E. A 1,300-foot pier (FIGURE IV - 262) at the southwest corner of the village of Lahad Datu is at the center of the beach, and radio masts are about ½ mile inland.

FIGURE IV - 262. *Northeast Borneo, Darvel Bay area.* Lahad Datu, pier and waterfront, looking northwestward.

The offshore approach is partly blocked by 6 small patches of reef with a maximum depth of 4 feet; the 3 northern reefs (Voorwyk) dry 2 feet. Exclusive of offshore reefs, the 30-foot line lies about 1 mile offshore at the southwest end of the beach, where the bottom slopes gently; the slope increases to the northeast end, where the 30-foot line is less than ½ mile offshore. The bottom sediment is mud to the southwest and mud and coral debris to the northeast. There is no current, and the beach area is almost completely landlocked. Mean high water springs rise 5¾ feet, and mean high water neaps rise 4 feet.

The southwesternmost ¼-mile of the beach is fine sand and mud; to the northeast the beach is bordered by coral reef which increases in width to more than ¼ mile. Behind the reef the beach is mud and fine coral sand. The beach slope is gentle to flat throughout. There are 2 piers, one 1,300 feet long, the other much shorter, and a number of native houses are built out on the reef. In the village there are potable but impure water, telephone, telegraph, and wireless.

Inland, the country is low and flat; a light railway and road lead north to tobacco plantations about 10 miles distant. Southwest of the beach there is mangrove-covered lowland. To the northeast, the land rises steeply behind coral-reef bordered shore.

(*e*) *Silam beach.* (PLAN 44, Section D(e); FIGURE IV - 261) Reliability POOR. A beach about ⅜ mile long at the town of Silam, near the head of Darvel Bay, extends from 4° 57′ 40″ N, 118° 12′ 25″ E to 4° 57′ 15″ N, 118° 12′ 05″ E. The limits of the beach are essentially those of the built-up part of the Silam waterfront (FIGURE IV - 261).

The offshore approach is through a large number of small islands and reefs. The bottom is irregular and does not have any uniform slope. At an average distance of ½ mile from the beach depths of 40 feet and more are found beyond most of the obstructing reefs. Deeper channels, with intervening drying reefs, extend shoreward. The bottom is mud and coral debris, or hard coral rock. The beach is protected from all winds and there is little current; springs rise 7¼ feet and neaps 4 feet.

The beach is low shore, in part built-up, fronted by drying reef. There are native houses on the reef, which is about 200 to 300 feet wide on the average, but extends out 1,000 feet in front of the center of the beach. A pier about 600 feet long crosses part of the reef; access to the pier, for small boats only, is by marked channel.

Beyond the limits of the beach to the northeast and southwest are mangrove-covered lowlands; inland, the surface rises with moderate slope to densely forested hills 500 to 1,000 feet high. There are a few hundred feet of road back of the beach, and 1,000 feet running inland. There is no information as to drinking water or communication facilities.

I. Sibuko Bay (Tawau area).
(PLANS 39 and 45)

(1) Offshore zone.

From Mount Putri on the east, to the village of Tawau (Tawao) to the west, the coast is almost entirely free of shoals and reefs, the 5-fathom curve being found about ½ to 1¼ miles offshore, except in the immediate vicinity of Tawau where depths of 7 to 9 fathoms exist close to shore.

Depths are everywhere regular in the eastern part of Cowie Bay, mostly from 6 to 11 fathoms, with a bottom of soft mud. The 5-fathom curve is found about ½ mile to 1 mile off the north shore of the bay. On the south shore, depths of 7 fathoms prevail close inshore, for the most part, from Grassy Point to Prescott Point, whence depths become shallower and slightly irregular eastward to the vicinity of Saima Point, where depths of 4 to 8 fathoms are found. From Saima Point to East Point the 5-fathom curve is 300 yards to about 2 miles from the coast, the edge of the coastal shelf being very steep-to all along the shore. From East Point to Steenenhoek (Stone Point), offshore depths again become shallow and the 5-fathom curve is found between 3 and 5 miles from the coast.

(2) Coastal topography.

(*a*) *North Shore.* From Mount Putri the coast trends in a general west-northwest direction for 12 miles, (the limits of the survey), and is intersected by numerous small creeks and rivers, the principal of which is the Merutai, 7 miles from Tawau, which can be ascended by launches for about 3 miles at high water.

Coastal plain, commonly 4 to 6 miles wide, extends from Mount Putri to and beyond Mangkalitan River. The ground is flat or gently undulating. Locally small steep-sided hills and ridges rise 200 to 500 feet above the plain which is interrupted by lines of rocky hills on either side of Tawau. Streams on the north side of Cowie Bay are short and, except when in flood, very small. Lower courses are nearly dry at low tide.

On the west side of the bay are swampy flats divided by many irregular channels. Lowlands are bordered by steep hills and ridges.

There are short strips of sandy beach near the village of Tawau. Nearly all of the west side of the bay and large areas on the north side along the coast and along rivers are swamp, where ground is perennially water-logged; some places are under standing water most of the year. Hills around Tawau have thin soil cover overlying hard lava rock. On either side of Tawau are hills formed of huge blocks and masses of rock with deep holes and large caverns between the blocks.

On the north side of Cowie Bay, extensive areas of mangrove and nipa swamp lie along the coast and border the streams. Slightly higher better-drained parts of the lowland are covered by tropical rain forest with dense tangle of vines, creepers, and undergrowth. The lowland around Tawau is clear for coconut and rubber plantations; abandoned areas are covered by second-growth forest. Patches of second-growth jungle and small clearings exist around the villages in the valleys and on the northeast part of coast.

(*b*) *South Shore.* Sebatik Island (PLAN 45), is about 20 miles long west-northwest—east-southeast and about 7 miles in average width; it is separated from the mainland to the northeast by Cowie Bay 3½ to 5 miles wide, but to the northwestward of the island there is only a narrow channel ½ mile in width separating it from other islands and from the Serudong Delta on the mainland. A range of densely wooded hills traverses the island throughout its length; the highest point of this range, Mount Antoinette, 1,550 feet in height, is in the middle. Cornelis Peak, 550 feet high, near the eastern end of the island, is a somewhat conspicuous point when viewed from any direction to the southward of southwest, but is less remarkable from other views.

Saima Point, immediately opposite Tawau, is a low mangrove point, not readily distinguished. From Saima Point the coast trends west-northwestward for 7 miles to Prescott Point, forming a slight shallow bight. It then takes a westerly trend for 7 miles to Grassy Point.

At 1⅝ miles southeast from Saima Point there is a stone beacon, covered at half tide on the edge of the mangrove swamp, to mark the exact spot where the parallel of 4° 10′ N cuts the coastline.

Grassy Point is somewhat conspicuous, being the first hard ground met with, appearing as a grassy opening of flat land fronted by clay cliffs 30 feet high. For a distance of 1 mile northeast from Grassy Point shoal water extends upward of 1,600 yards from the shore.

East Point, situated southeastward 4½ miles from Saima Point, is a rounded point with a hard sandy beach.

From East Point the coast trends southward with a slight indentation for 3¾ miles to Steenenhoek. About 1½ miles southwestward of Steenenhoek there is a very small islet close to the coast, which from there trends southwestward and westward for 3¼ miles to the south point of the island.

(3) Anchorages. (See Chapter VI.)

(4) Dangers to navigation.

The head of Cowie Bay is blocked across its entire breadth by numerous mud flats. Intricate channels, not navigable, flow across these mud flats forming a labyrinth of small bays. One-half mile north-northeast of Saima Point there is a small sand bank that dries 4 feet at low water, with a depth of 9 fathoms between it and the shore. Other dangers in the form of mud banks and shoal water are best seen on PLAN 45.

At 1½ miles northward of East Point and 1 mile from the coast, there is a sand bank that dries 4 feet; it is separated from the mud flats fronting the shore by a narrow channel.

(5) Landing beaches.

(a) Tawau beach. (PLAN 45, Section E(a)) Reliability POOR.

1. Location and extent. A beach which starts at the town of Tawau and extends about 6 miles to the east has its limits at 4° 14′ 15″ N, 117° 57′ 35″ E, and 4° 15′ 10″ N, 117° 52′ 55″ E. The eastern end is about 2 miles west of prominent Mount Putri, and the western end is approximately west of the wireless tower at Tawau.

2. Nearshore. The 30-foot line is 1,000 feet from the beach at Tawau; to the east it swings out and is more than 1 mile offshore at the east end of the beach. The bottom is mud and sand. Winds are variable, but are most common from the northwest. In the summer months, easterly winds and squalls are frequent. Spring highs rise 4 feet and neap highs 1 foot above mean tide level. Flood currents range from 1¼ to 2 knots, ebbs 1¾ to 2¼ knots.

3. Character of beach. The beach is fronted by a drying tidal flat which is 500 feet wide at Tawau, ½ mile wide off the mouth of Tawau River, and ¾ mile wide at the eastern end of the beach. The flat is mud and sand and in part is firm enough for walking; it covers at about ¾ flood. The western end of the beach, ¾ mile long, is mud, covered by mangrove in the eastern part. Thence for ¾ mile, to the easternmost pier, there is a sand beach 100 to 200 feet wide. Next to the east, a ½ mile stretch, including the mouth of the Tawau River, is mud beach, partly mangrove-covered. The beach in this vicinity is probably soft; is may be impossible to wade the river. The remainder of the beach is sand and is narrow to the eastern end, with a widening belt of mangrove in front of the beach. In the southwestern part of Tawau 3 small swampy areas, all within ⅓ mile, interrupt the beach. At Tawau there is a pier 726 feet long and numerous small piers and houses are built out over the tidal flat. Well water, potable but impure, can be obtained in the town.

4. Adjacent terrain and exits. At Tawau a road backs the beach within a distance of a few hundred feet. This road ties in with other roads that continue for a mile or 2 beyond the town. A hand railroad runs from the pier to a rubber estate 6 miles from town, direction not known. North of Tawau and north of the eastern part of the beach there is low country for several miles. A mile east of the beach there are steep, forested hills rising to more than 1,000 feet; the western end of the beach gives way to mangrove-covered lowland. There are wireless and telephone installations at Tawau.

(b) East Point beach. (PLAN 45, Section E(b)) Reliability POOR.

1. Location and extent. The eastern end of Sebatik Island is bordered by a beach about 7 miles long. Its limits are at 4° 09′ 45″ N, 117° 54′ 20″ E, and 4° 03′ 45″ N, 117° 55′ 40″ E. The northern end of the beach is approximately south-southeast 6 miles of Tawau and 7 miles southwest of Mount Putri. Near the southern end there is a prominent red cliff 80 feet high.

2. Nearshore. At the northern end of the beach the 30-foot line is 1 mile from shore; this distance increases gradually to more than 2½ miles at the center of the beach. In this part, the bottom rises steeply from 30 feet to about 10 feet, and then shoals gradually. Opposite the southern half of the beach the 30-foot line continues to leave the shore, until at the southern end it is 6½ miles distant. Opposite this half of the beach the bottom shoals gradually. Within the 30-foot line there are several sand bars and spits, chiefly in the northern half; the majority have a depth of 6 feet or more, but one dries at low water. Opposite the red cliff in the south a group of rocks 1 mile offshore dry 3 to 5 feet. The bottom is mud, sand, and hard sand. Winds are variable, but are most common from the northwest. In the summer months easterly winds and squalls are frequent. Easterly and southeasterly storm winds may raise moderately high waves. Spring highs rise about 4 feet and neap highs about 1 foot above mean tide level. Flood and ebb currents average about 1 to 1½ knots.

3. Character of beach. The beach is fronted by a drying tidal flat ¾ mile wide in the north, 1½ miles wide in the center and less than ½ mile wide in the south. The widest part is mud and sand, and much of it is firm enough to walk on. For ½ mile in the north the beach is muddy and soft, and is in part overgrown with mangrove. To the south, sand content increases and at East Point, about midway, there is a hard sandy beach backed by high casuarina trees. The southern part of the beach from 2½ to ¼ miles north of the southern end, is narrow, sand, and backed by cliffs 20 to 80 feet high. Crossing the beach are a few very small streams, which can be waded. There are no piers or other structures, though fish-traps made of stakes may be encountered.

4. Adjacent terrain and exits. Behind the beach the country is low and densely wooded for 1 mile in the north and several miles in the south. There are probably no habitations, roads, or trails, and other facilities are completely lacking. About 15 to 20 miles from the beach, on the southwest shore of Sebatik Island there are a few small villages; there is no information as to the character of the shore there. At the western tip of the island there is a small coaling station, with a pier and a cleared area.

F. Tarakan Island area.
(PLANS 40 and 46)

(1) Offshore zone.

From Ahoes (Ahus) Island on the north to the mouth of the Salinbatoe River on the south, the coast is broken by the innumerable islands and shallow passages of the delta of the Sesajap River. Depths within 7 to 10 miles of shore vary considerably, but for the most part are under 3 fathoms as far south as Boenjoe Island, except along the passages north and south of Tarakan Island where they vary from 7 to 22 fathoms. The least depth in the South Sesajap River is 10 feet, at its junction with the main river; least depth in the Middle Sesajap is 3 fathoms, and in the North Sesajap, 2½ fathoms. The average rise of the tide is 11 to 12 feet. In the delta both the flood and the ebb currents are strong, and ebb currents attain a velocity of more than 3 knots after a heavy rainfall.

(2) Coastal topography.

Ahoes Island, 12 miles northward of Boenjoe, and the coast near it are low, flat, and wooded with low trees.

The Sembakoeng River, immediately north of the Sesajap, reaches the sea by 2 branches. The northern discharges into the outer part of the Sesajap delta and is fronted by a bank with shallow water; the southern mouth is through the Moeara Serban, Moeara Ledoeng, and Troesan Gelagan, and is navigable by vessels of 12-foot draft to the village Sembakoeng, a distance of 35 miles. The average width of the upper part of the river is 400 yards. This decreases to 150 yards at Tagol, 45 miles from the mouth. Little is known of the river beyond this village.

The North Sesajap, near the west point of Baroe Island splits into 2 mouths—the Moeara Sabawang and Moeara Serban. The southern side of the Moeara Sabawang is formed by Tibi Island, the northern by Baroe Island and the banks extending eastward. Southward of Baroe Island are the islets Batok and Papa. The Moeara Serban flows between the islands Boenjoe and Baru on the south side and Mandoel Island and the main coast on the north side. A large bank that projects from the north shore extends 7 miles eastward.

The southern branch of the Sesajap River, from seaward through Batagau Strait, runs in a general west-northwestward direction north of Pajau Island and south of the large island Bangkoedoelis. Around the western side of Bangkoedoelis it curves round to the northward and unites with the main river.

Boenjoe or Tanahmerah Island is a high, thickly-wooded island visible 24 miles. It is uninhabited and is visited only for forest produce. Patches of reddish rock, from which the name Tanahmerah is derived may be seen here and there on the coast. Except for a portion of the northwest coast the entire island is surrounded by a reef, with many detached banks and reefs outside, for which reference must be made to the chart. Kruijs Reef is not marked by discoloration; occasionally a few ripples are seen.

Pajau Island, covered with small marsh palms and vegetation, is separated from Tarakan Island by Batagau Strait and from the main coast by Moeara Liagau and Apas Pajau. The South Sesajap River flows northward of the island. Pajau is square shaped, and from all points steep-to shoals extend ½ to 1 mile.

Menoeloen Island (PLAN 46), directly south of the southern point of Tarakan Island, is a small islet with high trees, visible 13 miles. It is surrounded by a drying reef extending 2 miles east—west. On the west side this reef is steep-to, but on the east side it is prolonged 3 miles farther by a narrow ridge of sand and is covered by depths gradually increasing to 5 fathoms.

Tarakan Island is a large island, hilly especially in the southern part, where it rises to a height of 462 feet, and wooded with high trees. In the northern part, near Djoewata Point, is a hill, 512 feet high, visible about 24 miles.

(3) Anchorages.

Eastward of the delta a bank of less than 3 fathoms extends 7 to 10 miles, and the water deepens rapidly between 10 and 20 fathoms. Up to 50 fathoms the bottom is mud, and outside this, black sand, which toward the 100-fathom curve is mixed with small shells and fine coral.

At the mouth of the Makapan (Moeara Makapan), 16 miles southeast of Tarakan Island, the flood current runs west-northwestward and the ebb runs east-southeastward.

Shoals, with depths over them of 1½ to 2½ fathoms, were reported (1940) to exist at several places within the South Sesajap.

For anchorages in Tarakan Harbor, see Chapter VI.

(4) Dangers to navigation.

Approximately 12 miles east of Ahoes Island is Banda Reef. Five miles southeast of Boenjoe Island, with a depth of 2¼ fathoms, is Kruijs Reef. About 2½ miles south of this reef stands Johanna Reef with ½ to 1 fathom of water. Adat Reef, with 2¾ fathoms water is located approximately 8 miles due south of Boenjoe Island. A shallow patch, with 3¼ fathoms water, is located about 20 miles due east of Boenjoe Island. Another such patch with 8 fathoms of water is located about 37 miles due east of Batu Point on the southern extremity of Tarakan Island.

(5) Landing beaches.

(a) Lingkas (Linkas) Tarakan Harbor. (PLANS 40 and 46, Section F(a); FIGURES IV - 263 to IV - 265) Reliability FAIR. A landing place extending along the southwest shore of Tarakan Island from 3° 17′ 07″ N, 117° 35′ 56″ E, to 3° 17′ 36″ N, 117° 35′ 28″ E, is about 4,000 feet long and is essentially straight. The southeastern limit is the southernmost of 2 prominent piers (each more than 1,000 feet long). The northwestern limit is the mouth of the Sibengkok River (arrows on FIGURE IV - 263). The landing place is the built-up part of Lingkas harbor plus an additional 500 feet beyond the northwest limit of that area. The 30-foot line runs close to the ends of the long piers, about 1,000 to 1,200 feet from shore. Shoreward, shoaling is rapid and a muddy flat 600 feet wide at the northwest to 800 feet wide at the southeast dries at low water.

Winds are generally east from December to April, west from July to October; squalls are common with east winds. There are 2 tides a day; springs rise 11 to 12 feet, neaps 3 to 4 feet. A current of 1 to 2 knots sets to the northwest on flood tide, and may attain a maximum of 4 knots to southeast on ebb tide. The area is well protected from all winds; waves are small, and surf is inconsiderable.

There is no beach (FIGURES IV - 264 and IV - 265). At high tide landing may be made on piers, on numerous small wharves and buildings which are supported on piles and extend about 100 to 200 feet out from the high tide line, or directly on the low flat shore. At low tide, the tidal flat is probably too soft and sticky to support motorized equipment, and may not be pass-

FIGURE IV - 263. *Northeast Borneo, Tarakan Island.*
Lingkas (Tarakan Harbor). Top of Figure is approximately W. Landing place is between arrows. 1930.

able on foot. Inland from the landing place the land has a moderate slope to heights of 50 to 75 feet; this rolling, low country extends to Tarakan, about 1½ miles from Lingkas. Beyond the limits of the landing place, to northwest and southeast, is mangrove swamp. Several local unpaved roads a few hundred yards to a mile long run inland from the landing area; a macadam road and a narrow-gauge railroad connect Lingkas with Tarakan. There are a wireless station and telegraph and telephone systems in Tarakan. The airport which serves this area is about 3 miles northwest of the landing place, and is reached by paved road.

(*b*) *East shore Tarakan Island beach.* (PLANS 40 and 46, Section F(b)) Reliability FAIR.

1. Location and extent. A long continuous beach borders the eastern side of Tarakan Island from 3° 24′ 25″ N, 117° 40′ 12″ E, to 3° 15′ 50″ N, 117° 39′ 20″ E. The beach is about 10½ miles long.

2. Nearshore. Seaward from the beach a shoal area 20 miles long east—west and 10 miles wide has an average depth of about 15 feet (PLAN 40). Within a mile of the beach depths of 2 to 6 feet prevail. A drying coral reef 500 to 1,000 feet wide borders 2 miles of the beach, at the south end. There are 2 tides a day; springs rise 11 to 12 feet, neaps 3 to 4 feet. From July to October the beach is protected from the prevailing west winds. From December to April winds are from the east (principally the northeastern quadrant) and squalls are frequent. The beach is well protected from large waves by the shoal area to the east; combers may be expected anywhere from the beach line to 1 or 2 miles out. The current over the shoal area has a uniform set

to the southwest, but near the beach it will probably not be over ½ knot; farther out currents of 2 knots are encountered.

3. Character of beach. The beach has a very low slope and is probably fine sand or mud. About 10 more or less equally spaced streams cross the beach and small areas of marsh interrupt its continuity. During strongest winds there may be several lines of low surf, but generally wave action is unimportant. Currents are negligible. At low tide the beach is fronted by a wide, muddy tidal flat. Landings are made by natives at the end of a trail from Tarakan at approximately 3° 18′ 30″ N, 117° 39′ 25″ E. Elsewhere the beach may be soft and sticky.

4. Adjacent terrain and exits. The northern half of the beach is backed by a swampy area which is 3 miles wide at the north and tapers to an average of ½ mile wide. The southern half of the beach has a variable but narrower swampy area behind it; the average width is less than ¼ mile. For about 1 mile north and ½ mile south of the end of the trail from Tarakan mentioned above, firm dry ground is found for about ¼ mile back from the beach. The trail appears to have more than intermittent use since it is bridged at 3 places. Behind the swampy area is low, forested country below 75 feet in height. Between the beach and Tarakan (about 3 miles) at the latitude of the trail there are no altitudes over about 225 feet. Tarakan has the nearest habitations and facilities such as telegraph, telephone, and wireless. Streams that cross the beach are probably brackish at the mouth and for a mile or more inland.

(*c*) *Northwest shore Tarakan Island beach.* (PLANS 40 and 46, Section F(c)) Reliability POOR.

1. Location and extent. A discontinuous beach borders the northwest shore of Tarakan Island from 3° 25′ 00″ N, 117° 31′ 05″ E to 3° 26′ 25″ N, 117° 34′ 10″ E. The length of the beach, not including interruptions, is about 3½ miles; the total length is about 4½ miles. Part of the beach borders Djoewata (Juata) Point; this point is at the end of a 100- to 200-foot-high ridge, which is the only high land to reach the north coast of Tarakan. The eastern end of the beach is about

FIGURE IV - 264. *Northeast Borneo, Tarakan Island.*
Lingkas (Tarakan Harbor), looking N, over northern pier. Tide stage not known. Tidal flat (left middleground) may dry farther out. Altitude of surface and character of vegetation in background are typical of country between Lingkas and Tarakan. Date unknown.

FIGURE IV - 265. *Northeast Borneo, Tarakan Island.*
Lingkas (Tarakan Harbor), N pier at left, S pier at right, outside of picture. Looking northwestward. 1932.

1½ miles east of Djoewata Point; the western end is at Sepoenti Point.

2. Nearshore. The slope from the beach to the 30-foot depth line is steep and the 30-foot line is probably nowhere more than 500 feet offshore. The bottom is generally muddy, though rocky bottom may be expected off Djoewata Point. There are 2 tides daily; springs rise 11 to 12 feet, neaps 3 to 4 feet. Currents of 1 to 2 knots may be expected on floods, and perhaps as much as 5 to 6 knots on ebbs. The area is well protected from all winds, and waves are small.

3. Character of beach. The beach is probably fine sand or mud except along the stretch fronting Djoewata Point, where sand and pebbles may be found. The slope is flat and much of the beach is fronted by a mangrove-covered tidal flat. The southwestern half is crossed by many small, low-gradient streams. There is no surf, but currents of 1 to 2 knots may be expected.

4. Adjacent terrain and exits. A trail from the native village of Djoewata ends at the beach 1 mile southwest of Djoewata Point; the landing place is used by native boats. This part of the beach and the mile-long stretch at Djoewata Point appear to be the most favorable landing areas. Except for the Djoewata Point area, the beach is backed by swamp ¼ mile to more than 1 mile wide. Behind the swamp is a mile-wide belt of low, forested country. From Djoewata Point south there is rolling country 50 to 350 feet high; the country is forested and there are a number of streams crossing at various angles. Djoewata Boorterrein, at the end of a paved road from Lingkas, is 5 miles from Djoewata Point. Potable water can be found at the village of Djoewata, ½ mile southwest of Djoewata Point; the road-head at Djoewata Boorterrein is the nearest location for any other facilities.

46. Northern Celebes

PLAN 48 shows the entire sector discussed under Topic 46 and indicates the general coastal characteristics. This plan indicates also those coastal sections which are discussed below in greater detail.

A. Gorontalo Bay.
(PLANS 50 and 51)

(1) Offshore zone.

From Limba Bay on the west to Tomboelilata Point on the east, the coast rises steeply from deep water, the 100-fathom curve being found at a distance of about 1 mile, and depths of over 1,000 fathoms at about 3 miles, from the coast. Gorontalo Bay (FIGURE IV - 266), formed by an inlet in this mountainous coast, is a little more than 1½ miles in width at its entrance between Kajoeboelan Point on the west and an unnamed point on the east, and the bay, including the inner harbor, recedes 1⅛ miles to the northward. The inner harbor at the head of the bay (FIGURE IV - 267) is formed by the estuary of the Bolango-Bone Rivers, and is about 500 yards wide and 700 yards long. The middle of this harbor has depths of 40 to 70 fathoms, beyond which the bottom slopes upward to a depth of about 22 fathoms in the middle of the mouth of the river, and then rises sharply to the shallow river bottom, which is only a few feet deep at the head of the harbor, due to the silt deposited by the Bolango-Bone Rivers. The bottom of the harbor is muddy but the bed of the river is firm and rocky. In about the center of the outer bay a charted depth of 86 fathoms is indicated. The shore of the inner harbor is bordered by a narrow flat, probably of

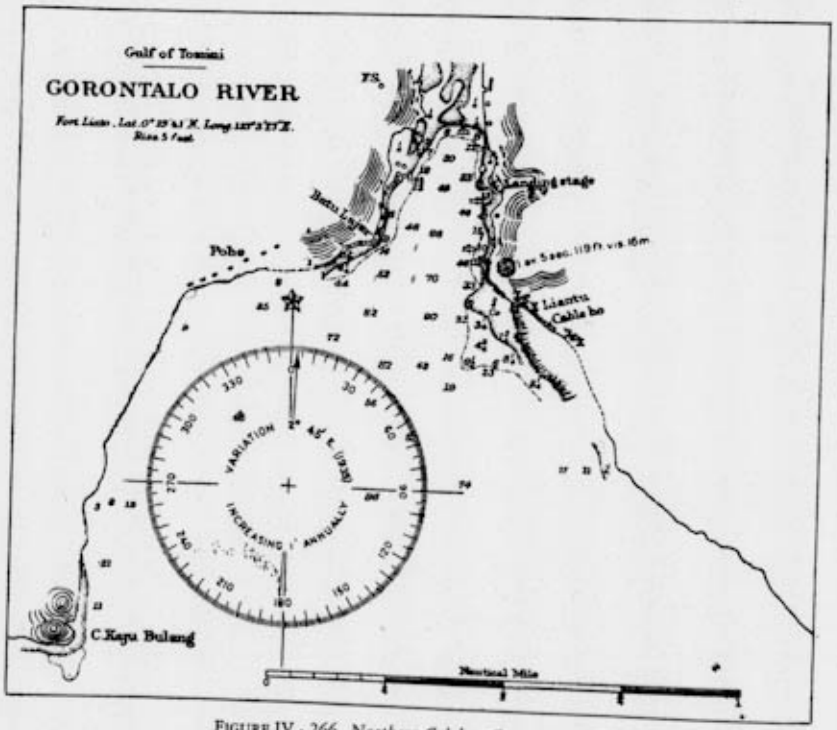


FIGURE IV - 266. *Northern Celebes, Gorontalo Bay.*
Chart showing estuary of Bolango and Bone Rivers at head of Gorontalo Bay. Soundings in fathoms.

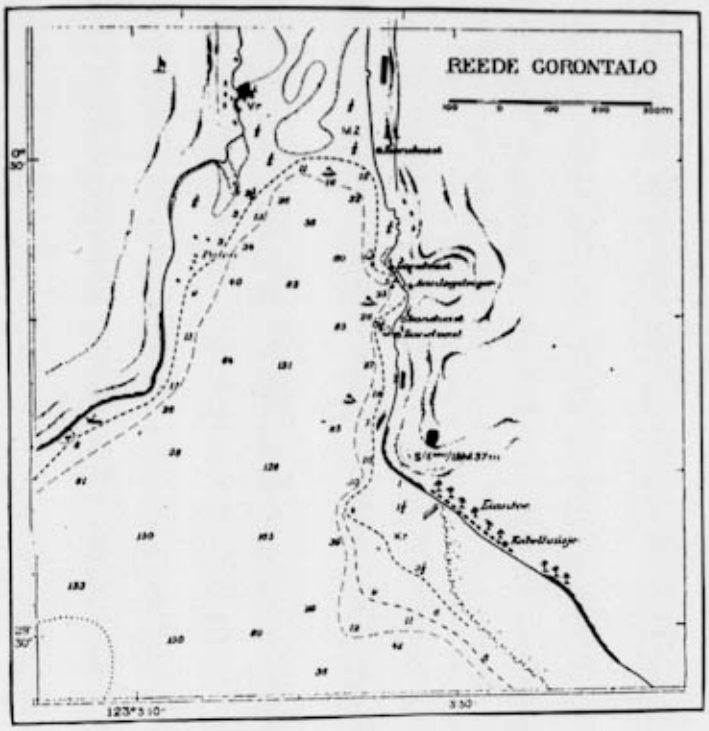


FIGURE IV - 267. *Northern Celebes, Gorontalo Bay.*
Section from NHO chart 305, showing head of bay. Soundings in meters.

coral, and on the east side of the outer bay, just beyond the inner harbor, a fringing coral reef about 200 yards in width, extends along the beach for a distance of 500 yards. At this point the 10-fathom curve recedes to a maximum distance of 400 yards from the shore.

During the season of the south monsoon, especially in July and August, there is a heavy sea along the west side of Gorontalo Bay. There are often extremely strong currents in the bay from the river, and at times there is a cross current at the entrance which usually sets to the westward, but does not last very long. Gorontalo Bay has the disadvantages of limited space, great depth, and strong currents.

(2) Coastal topography.

The coast east and west of Gorontalo Bay is steep and mountainous (FIGURES IV - 268 and IV - 269). Many rocky headlands separate small isolated coves. The slopes are generally steeper than 50%, and not uncommonly are 70% or more. The headlands are usually fringed by coral reefs; narrow sandy beaches are common in coves (FIGURE IV - 270). Gorontalo Bay, although dominated by high terrain, is one of the principal gateways through the steep mountain ridge to the broad intensively cultivated interior lowlands. The ground is chiefly composed of thin, stony, mountain soil, which is mostly well-drained. The vegetation is that of a moderately luxuriant primary jungle, but large parts of the land have been cleared for agriculture. Many of these clearings have reverted to secondary jungle.

The port of Gorontalo, formed by an indentation in the rocky coastline, lies at the mouth of an estuary formed by the confluence of 2 rivers, the Bolango and the Bone. The town is located 2 miles farther up-stream, on the east bank and at the head of the estuary. The 2-mile river stretch from the harbor to the town is not navigable. The town is located on a low tongue of land in the lower end of a valley which widens and levels off into a broad plain as it extends inland.

The terrain surrounding Gorontalo is mountainous; the hills on both sides of the harbor are approximately 1,200 feet high (FIGURE IV - 271) and hide the plain behind so that the town cannot be seen from the sea, although the cleft thus formed is visible from a considerable distance (FIGURE IV - 272). The slope on the east side is less precipitous than on the west. The banks on both sides fall directly into the sea except for occasional short strips of sandy beach backed by steep hills or cliffs, a strip of sand at the small-boat pier on the west side, and a strip of sandy beach several hundred yards long located on the west side of the harbor, stopping just west of the harbor entrance. Coconut palms grow thickly on this last-mentioned beach and extend inland several hundred feet up the sharp slope of the hills. The hills on either side of the harbor are covered with tropical growth and because of their steepness and underbrush are difficult to traverse. There are jetties and buildings along the waterfront of the port. Roads parallel the east and west sides of the bay.

(3) Anchorages. (See Chapter VI.)

FIGURE IV - 268. *Northern Celebes, Gorontalo Bay.*
W side of bay, looking W toward Batu Lajar. Pohe beach and village beyond ship.

FIGURE IV - 269. *Northern Celebes, Gorontalo Bay.*
W side of bay, probably looking NW toward part of Pohe beach.

FIGURE IV - 270. *Northern Celebes, Gorontalo Bay.*
Pohe beach in foreground. Surf breaks directly upon sandy beach free of coral reef. Looking SE across mouth of bay.

(4) Dangers to navigation.

The only danger in Gorontalo Bay is a shoal which extends about 350 yards beyond the fringing reef on the northeast shore of the bay, just outside the inner harbor. This shoal has a least depth of ¾ fathom near the shore and a depth of 6½ fathoms at its outer edge.

(5) Landing beaches.

(a) Beaches west of Gorontalo Bay. (PLANS 50 and 51, Section A(a)) Reliability POOR. Between Gorontalo Bay and Pagoejama Bay, 24 miles to the west, the shore is generally steep, with scattered small sandy beaches generally at the heads of coves. One of these beaches fronts the village of Beloewo, 15 miles west of the entrance to Gorontalo Bay, at 0° 29′ 20″ N, 122° 19′ 10″ E. Others are similarly located fronting small villages situated within 6 miles of the bay entrance, at 0° 29′ 05″ N, 122° 57′ 25″ E, at 0° 29′ 10″ N, 122° 59′ 35″ E, at 0° 29′ 10″ N, 123° 00′ 30″ E, and at 0° 29′ 20″ N, 123° 01′ 40″ E. Fronting the first 2 beaches, and at the east end of the fourth beach (0° 29′ 10″ N, 123° 00′ 30″ E), are narrow strips of coral reef. The other beaches are apparently free of coral. All are used as landing places by the natives.

The beaches are composed of sand and pebbles and generally have steep slopes and firm surfaces. Those fronted by coral reefs have some coral sand mixed with the quartz sand. The bottom slopes steeply off the seaward edge of the coral reef, and directly off the beaches which do not have coral reef. The weather is mild and the surf light to moderate throughout most of the year, but during the southeast monsoon season strong winds raise a considerable sea, in which case waves break heavily on the beach, or on the reef where it is present. The beaches are backed by heavily forested terrain rising steeply to mountains 2,000 to 2,400 feet high. A trail parallels the shore a short distance inland.

(b) Landing places in Gorontalo Bay. (PLAN 50, Section A(b)) Reliability FAIR. There are 5 landing places in Gorontalo Bay: 2 beaches—one with a pier at its east end—are on the west side of the bay; a pier, a landing stage, and a beach are on the east side of the bay. The town of Gorontalo, 2 miles upstream, has a low shore and a landing place for boats, but the river is shallow. Only the east beach is fronted by coral reef, which varies in width from nothing at the northwest end of the beach to 500 feet at the southeast end. The surf breaks at the edge of the reef and again on the beach. The 30-foot depth line lies about 700 feet from the shore. The depth line is 200 to 300 feet off the beaches on the west shore of the bay. The beaches have gentle to moderate slopes and are composed chiefly of sand. All are used for landings by the natives and are generally firm. The slopes back of the beaches are steep and wooded. Roads lead inland from the piers on both sides of the river at the head of Gorontalo Bay.

(c) Beaches east of Gorontalo Bay. (PLAN 51, Section A(c)) Reliability FAIR. The shore is lined with a series of coves for a distance of 7 miles east from the entrance of Gorontalo Bay (FIGURE IV - 273). In each cove is a small beach

Eight of these are located on the chart. Some of them are fronted by limited coral reef areas. Depths of 30 feet are encountered close to the shore. The beaches are composed of sand and pebbles, including very little coral sand. Their slopes are generally steep and fairly firm. In many places they are used for landings and front small settlements. The terrain back of them is generally steep. A trail follows the coast a short distance inland to Gorontalo town, from which a macadamized road leads north across the peninsula to Koendang Bay.

B. Kema Road.
(PLAN 55)

(1) Offshore zone.

From Mangket Point on the south to Mera Point on the north, a distance of 7 miles in a straight line, the coast is bordered, except in Kema Road itself, by a fringing coral reef which has a maximum width of about 1,000 yards. The reef is much wider to the south of Kema Road than to the north of it. Along this stretch of the coast the 10-fathom curve lies at a mean distance of ½ mile and the 100-fathom curve is 3 to 5 miles distant from the shore. There is reported to be a current setting to the northward along this coast at a rate of 1 to 1½ knots.

Kema Road is formed by a slightly indented bight in the coast (FIGURE IV - 274). It is 1 mile wide between entrance points and recedes 750 yards. The depths are about 7 fathoms on the line between the entrance points, and shoal very gradually, the 5-fathom curve being about 500 yards and the 3-fathom curve about 300 yards from shore. The 10-fathom curve lies outside the line between the entrance points at a maximum distance of 1,400 yards from the shore. The fringing coastal reef stops at the entrance point, and the shoreline of the roadstead itself is clear, with depths of 1½ to 4½ feet close to the beach. The bottom is indicated on the chart as sand and stones within the 3-fathom curve, and coral on the 5½-fathom shoal that lies ½ mile east of the southern entrance point.

During the southwest monsoon season, June to September inclusive, the swell breaks heavily on the beach along the roadstead shore.

(2) Coastal topography.

The terrain at Kema and to the north and south consists of a coastal plain 2 miles long, rising inland to steep volcanic slopes. The plain itself nowhere exceeds a mile in width. The ground is chiefly sandy soil, which may be partly marshy during the rainy season. The vegetation is chiefly coconut groves and some secondary woods and grassland. From Kema to the southward, the flat, monotonously wooded coast offers no conspicuous points, and Mangket Point is rather low, being visible only from the northeast and southwest.

The village of Kema is situated on a low plain covered with coconut plantations and scattered mangroves, at the foot of Mount Kalabat, a conspicuous conical peak 6,634 feet high. Near the town a small river flows into the sea. The mouth of this river dries at low water. The town is not plainly visible from the sea, especially when approached from the south, because of the cliffs on the south side of the roadstead.

FIGURE IV - 271. *Northern Celebes, Gorontalo Bay.*
Looking SE across bay mouth from cliff base at Batu Lajar. Rocky shore in foreground. Narrow beach on opposite shore. Bayhead out of sight to left.

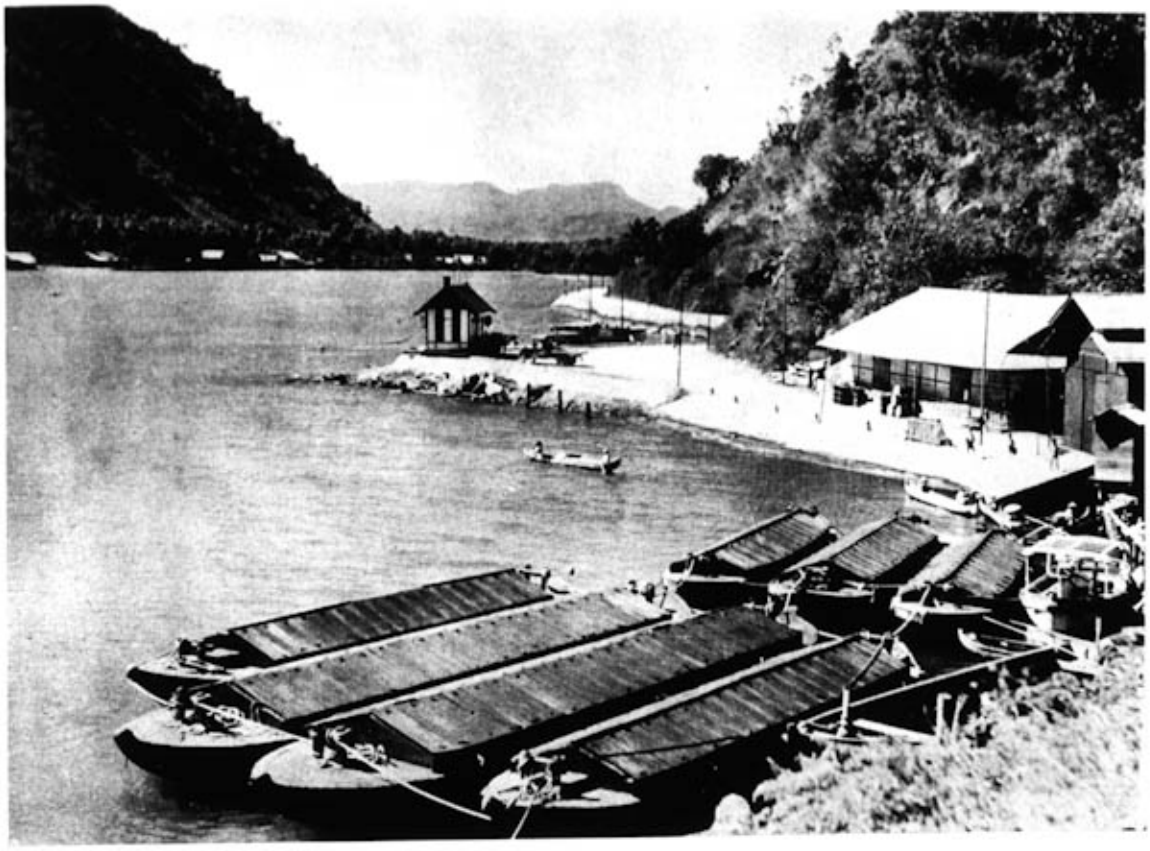


FIGURE IV - 272. *Northern Celebes, Gorontalo Bay.*
Inner part of bay. Looking NNE toward Bolango-Bone estuary mouth from landing stage 600 feet south of E pier at bayhead. 1937.

FIGURE IV - 273. *Northern Celebes, Gorontalo Bay.*
E coast of bay. Looking SE. Surf breaks on edge of coral reef and on the beach along shore. 1937.

Back of the coast at Kema a densely wooded ridge, attaining its greatest height in Mount Kalabat, parallels the shore, about 5 miles inland. From this ridge numerous spurs approach the coast, with occasional sandy beaches between them.

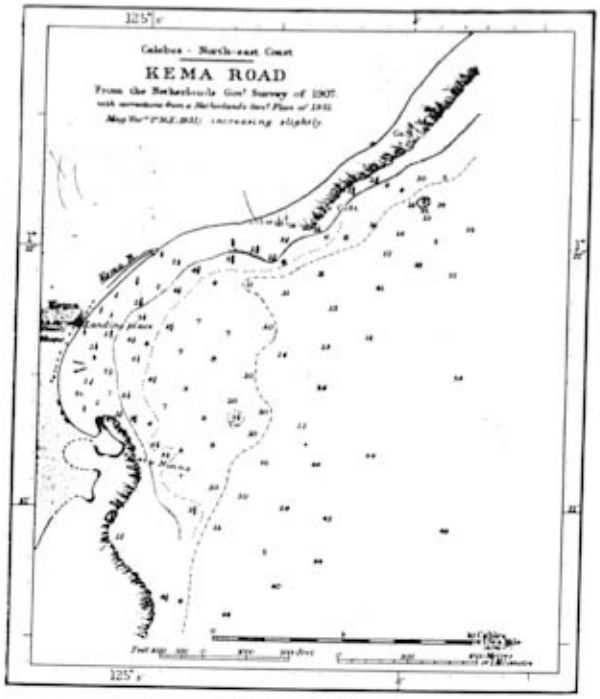


FIGURE IV - 274. *Northern Celebes, Kema Road.*
Section from USHO chart 930. Soundings in fathoms.

(3) Anchorages. (See Chapter VI.)

(4) Dangers to navigation.

On the north side of Kema roadstead, outside the 10-fathom curve, and about 600 yards offshore, is a detached rock over which there is a depth of 3 fathoms, 1 mile 76° from Kema River entrance. There is also a 5½-fathom shoal about 1,400 yards east-southeastward of the landing place. A shoal with a least depth of 3 feet has been discovered 600 yards 161° from Kema Light.

(5) Landing beaches at Kema.

(PLAN 55, Section B(a)) Reliability FAIR.

A beach at Kema (FIGURE IV - 275) has its center at approximately 1° 21′ 30″ N, 125° 04′ 40″ E. The southern limit of the beach is marked by the low bluffs south of the village (FIGURE IV - 276). The northern limit is uncertain; beach is present as far north as the village, and may extend 500 to 1,500 feet beyond. The 30-foot depth line lies 1,300 to 2,000 feet offshore, and the approach is clear over a gently sloping bottom. From May to September winds are from the east and southeast, and surf breaks heavily on the beach; from October to April there is little or no surf. Spring tides rise 3 feet, neaps 6 inches. Offshore, a current of 1 to 1½ knots to the northeast generally prevails.

The beach is coral sand mixed with dark volcanic sand and a smaller proportion of coral debris (FIGURE IV - 277). The width is about 20 to 40 feet and the surface is firm enough for motorized equipment. Beach slope is 1 on 10 to 1 on 20. Fish weirs and small landing structures built across the beach and tidal flat indicate that piles can be jetted or driven. The beach is flanked and backed by lowland which is partly cultivated; elsewhere growth is not dense, and open grass patches are common. Kema is on the main road net of northeastern Celebes. A hard-surface road leads northwestward to Manado; other roads connect Kema with most of the known beach areas within a distance of 40 miles. To the northeast, a secondary road parallels the coast for 10 miles; information is lacking, but there may be beaches along this shore, particularly at the village of Girian. Kema has telephone connections, but there is no telegraph or wireless.

C. Bangka Strait and vicinity.

(PLAN 55)

(1) Offshore zone.

From the northern entrance of Lembeh Strait to Poeisan Point the waters off the northeastern tip of Northern Celebes are clear, the 100-fathom curve lying within ½ mile of the coast, passing around islands to the north of Bangka Strait close-in. The 5-fathom line parallels the greater part of this coast, ex-

FIGURE IV - 275. *Northern Celebes, Kema Road.*
Beach at Kema, looking S. 1928 or 1929.

FIGURE IV - 276. *Northern Celebes, Kema Road.*
Bluffs in background form a peninsula south of Kema beach (right). Fish weir extends into water from bluff at end of beach. Looking SW. 1929.

FIGURE IV - 277. *Northern Celebes, Kema Road.*
Beach, looking N. Prior to 1929.

cept in some places along the south shore of Bangka Strait where it is as much as 1½ miles offshore. Along parts of the coast there are strips of fringing reef and some rocks.

Bangka Strait is a roadstead, about 3 miles across, open at the east and west and bounded on the north by Bangka Island. Talisei Island, and several smaller islands. Southward of a line drawn from Mokotamba Point to Bohoi Point there are many shallow spots. One of these spots, for example, is Korrier Rock. This rock consists of white coral sand, stones and shells, covered with about 3 fathoms of water. The rock may be recognized by tide rips.

Except for Korrier Rock and the reefs inside the line joining Bohoi Point and the point east of Likoepang, depths of 5 to 10 fathoms were found recently on all the banks and shoals lying in the strait. The 4-fathom patch, charted 1¾ miles 17° from Likoepang village, was not found, but it probably exists, although no discoloration was seen. All reefs can be seen in clear weather at a distance of ½ mile.

Likoepang village (FIGURE IV - 278), 5 miles westward of Mokotamba, lies on the west side of the mouth of the Likoepang River. The 2 points eastward of the river are covered with trees to the edge of the water. The shore here is shelving and fringed by coral.

Westward of Likoepang are 2 low islets, the larger of which is Tamperong, and several shoals, reefs, and drying sand banks, extending to a distance of nearly 2 miles from the coast. The shore and islets are covered with mangroves and fringed with coral.

Bohoi Point, opposite Gangga Island, is low and rounded. There are trees on it, 100 feet high. It is fringed by a reef nearly 100 yards wide, on which the trees grow out beyond high water mark. One mile west of Bohoi Point is the entrance to Bohoi Bay, a small circular bay 300 to 400 yards in diameter, with a depth of 8 fathoms in the middle. The entrance is closed by a reef on which the depth is 9 feet. There are a few houses and gardens on the shore of the bay.

Torawitan Point (North Cape) is rocky and thickly wooded to the water's edge, the tops of the trees being about 100 feet

above the sea. The land slopes gently upward from the point to a hill 840 feet high 1 mile to the southward, which is the general height of the land at the same distance from the shore all along the north coast. The point is fringed by a coral reef about 50 yards wide and very steep-to, and on its eastern side there is a beach of white coral.

(2) Coastal topography.

From the northern entrance of Lemben Strait the coast trends in a northwesterly direction for 8 miles to a series of cliffs 300 feet high, which are pierced by caverns. The southeastern end of this coast is low, rocky and thickly wooded, rising continuously at the back to the summits of Mount Batoe Angoes, (3,721 feet) and the twin peaks of Doea Soedara (4,478 and 3,888 feet). The northwestern part of the coast consists of a long, black sandy beach with native huts on it. From the perforated cliffs the coast trends in a north by east direction for 5 miles to Poeisan Point and consists of long, steep beaches of coarse, black, volcanic sand. The adjining terrain along this stretch of coast is hilly and wooded.

Mogogimboen Island is small, wooded, and conical. It is 163 feet high, and lies about ½ mile off Rinondoran. The southern side of the island is steep-to. A reef extends from its north side for ½ mile and has on it several rocks, 2 of which show at high water. With the slightest sea or swell the surf breaks heavily upon these rocks. Kalinanon Island is small and joined to the mainland by a reef which extends nearly ¼ mile to the southward. The islet is some 250 feet high and heavily wooded. Batoe Pandita (Bundita) is a sharp-pointed rock with a white top about 30 feet high and forms a conspicuous landmark.

Bangka Island on the north side of Bangka Strait is 6½ miles long, 1½ miles wide, of irregular contour, and has some bare slopes. The island is densely wooded except in several clear spaces where coarse grass grows. On the western side of the island are several round-topped conical hills ranging from 600 to 800 feet high. The northern shore of the island is formed by low mangroves. Batoe Gosoh Point, the eastern point of the island is a sharp conical hill, 266 feet high, well wooded and joined to the main island (Bangka) by a low neck of land. The south side of a bay called Jiko Sago is formed by a narrow tongue of

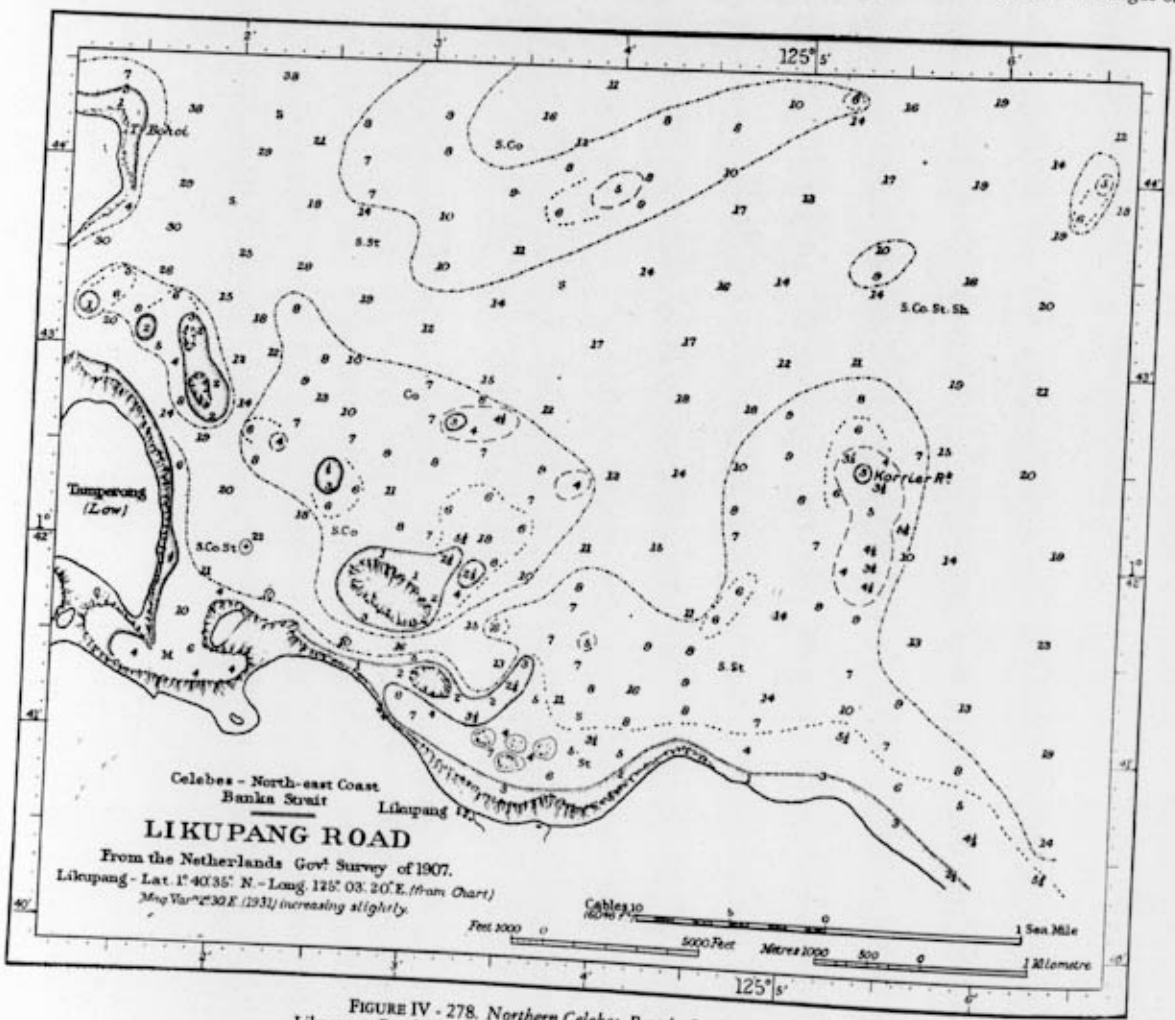


FIGURE IV - 278. *Northern Celebes, Bangka Strait Coast.*
Likoepang Road. Section from USHO chart 930. Soundings in fathoms.

land with an extensive reef projecting to the southward, on which are located Sahaong Island and several rocks above water, against which the sea breaks. The extreme southern part of Bangka terminates on a low, cliffy point rising to a conical hill 280 feet high. The west coast of Bangka Island is low and is fringed by a coral reef which extends 200 yards from the shore. The extreme western point of the island is a low, dark, red cliff with trees, south of which there are coconut groves fringed by a sandy beach. Northeastward is a small bay with a soft muddy bottom, which is the only place among the islands to the northeast of the Celebes where a boat can be beached. A small stream flows into the head of the bay.

From Poeisan Point to Torawitan Point the coast is very irregular, low in the northwestern part and higher in the eastern part. This entire coastline is covered with dense vegetation. The exact extent of the vegetation from the water's edge is unknown, but the ground behind rises gradually to inland mountains. Poeisan Point (Cape Coffin) is a bold point with large boulders off it and a narrow fringe of coral. From this point the land rises abruptly to a high tableland 974 feet high, 1 mile long, and thickly wooded, easily distinguished from all sides by its square, boxlike aspect. West of this point a black, pyramidal rock, 18 feet high, connected at low water with a steep point about 300 feet high, forms a conspicuous landmark. Mokotamba Point, 1½ miles to the westward of the north extremity of Poeisan Point, is steep, about 200 feet high, and surrounded by high boulders extending seaward about 200 yards.

(3) Anchorages.

Good anchorage can be found in the bay west of Mogogimboen Island in 17 fathoms, shoaling gradually to 3 fathoms close to the beach. This anchorage is protected from the swell and from southerly winds.

In Jiko Sago off the southeast coast of Bangka Island, there is anchorage in 20 fathoms, ½ mile from the shore, over a coral-sand bottom. Bangka Strait is not considered suitable for anchorage because of the exposed entrances through the roadstead. Vessels can navigate the strait without difficulty because the water is generally safe for vessels up to 20 feet draft. The water is generally very clear, and the sandy bottom can often be seen in 8 to 10 fathoms in a calm sea. Tidal currents run at the rate of 2 to 3 knots at springs between Poeisan Point and Bangka Island. Vessels of over 20 feet draft should avoid 2 shoal spots located 2¾ miles north of Likoepang. One of these is named on the chart, Korrier Rock. The other is unnamed.

(4) Dangers to navigation.

Vessels can navigate along this stretch of coast from the northern entrance of Lembeh Strait to Poeisan Point without difficulty as there are no dangers, except close-in. Here there are narrow stretches of scattered coral reefs, particularly in the small bay.

Bangka Strait is clear for vessels up to 20 feet draft south of a line extending from Sahaong Point on Bangka Island to the southern tip of Gangga Island and north of a similar line drawn between Poeisan Point and Bohoi Point. Southward of this latter line there are many shoal spots, some of which have only 2 fathoms over them. Two of these shoal spots are described above under Anchorages.

(5) Landing beaches.

(a) Beaches in vicinity of Rinondoran. (PLAN 55, Section B(b)) Reliability POOR. For about 5 miles north and south of the village of Rinondoran (1° 36′ 15″ N, 125° 08′ 40″ E) the shore is bordered by beach. The beach limits are known only approximately. The northern limit is near Batoe Pandita, a sharp-pointed, white-topped rock about 1 mile west of Poeisan Point. The southern limit is marked by the beginning of low rock cliffs, which are continuous to the southeast as far as Lembeh Strait. The 30-foot depth line is close-in, and the bottom slopes steeply. Except for the small island of Mogogimboen east of Rinondoran the approach is clear. During the southeast monsoon (May to September) waves and surf are high. From October to April the beach is well protected. Tidal range is about 3 feet at springs, 1 foot or less at neaps. The beach is black volcanic sand and has a steep slope. The beach is continuous for great distances; interruptions are widely-spaced and consist of 6 or 8 equally spaced streams and a like number of reef-fringed rocky headlands. It is likely that the streams can be waded, although the beach near stream mouths may be softer than elsewhere. The headlands usually have a narrow fringe of coral reef and the nearshore approach may be dangerous. The center of the beach is backed by lowland more than 1 mile wide; to the north and south, wooded, hilly country lies immediately behind. From Rinondoran a secondary road trends southward to Girian, and another road trends northwestward, joining the Manado road 10 miles away. Trails from Rinondoran parallel the beach for about 2 miles north and south of the village. There is no information as to facilities in this area.

(b) Bangka Island beach. (PLAN 55, Section B(c)) Reliability FAIR. For about ¾ mile north, and 3½ miles south of the village of Kahoekoe (1° 47′ 55″ N, 125° 07′ 20″ E) the western shore of Bangka Island is bordered by beach. The beach limits are fixed only approximately. At the north, the beach starts just south of a red cliff. The southern limit probably includes native houses not far from Sahaong Point at the southern tip of the island. The 30-foot depth line is generally less than 750 feet from the shore and the approach is clear over a sand, coral, and stone bottom. From November to April winds are from the west and northwest and, although the beach is somewhat protected by off-lying islands, moderate to heavy waves and surf may be expected. The beach is sand, but information as to its width, slope, and firmness is lacking. A number of small streams cross the beach; they are probably not large enough to impede movement of troops or motorized equipment. The country behind the beach is gently rolling and increases in slope toward the east. Some of the hills are bare of forest cover. There are probably no facilities on the island; pure spring water can be obtained at Talisei village on Talisei Island, about 4 miles to the northwest.

(c) Landing place at Likoepang. (PLAN 55, Section B(d)) Reliability GOOD. At Likoepang (1° 40′ 30″ N, 125° 03′ 30″ E) there is no beach, but the low shore is suitable for landing operations (FIGURE IV - 279). The 30-foot depth line lies about 1,500 feet offshore and there are a number of sandbanks and other shoals just seaward of this depth. The clearest approach is from the northeast, over gently sloping stony bottom. The landing area is well protected from all winds. Tidal range is about 3 feet at springs, 1 foot at neaps. The shore is fringed by drying coral reef about 800 feet wide, and at low tide it may be impossible to approach closer than ¼ mile from the

FIGURE IV - 279. *Northern Celebes, Bangka Strait Coast.*
Likoepang, landing place. Direction unknown. 1939.

shore. The extent of the open growth lining the shore is not known; possibly it is no more than 500 feet. To the east and west the shore is densely wooded. A narrow dirt road, passable for automobile, runs from Likoepang to the hard surface Manado—Kema road about 20 miles distant. The Likoepang River water is fresh a short distance upstream; the water is potable but impure. Information as to other facilities is lacking.

(d) Bohoi Bay beach. (PLAN 55, Section B(e)) Reliability POOR. A short beach borders the shore near the village of Serej (1° 44′ 30″ N, 125° 00′ 30″ E) in Bohoi Bay. The bay mouth is completely closed by a coral reef over which there is a depth of 9 feet. Otherwise, the approach is clear, and the beach is protected from all winds. Tidal range is about 2 to 5 feet. The beach is made of a mixture of coral sand and volcanic rock boulders. From Serej a trail leads south for 5 miles and joins a secondary road 3 miles from the Manado—Likoepang road.

D. Manado Bay.

(PLANS 55 and 62)

(1) Offshore zone.

Manado Bay is nearly 8 miles wide at the entrance between Pisok Point on the north and Kalasei Point on the south. From the line between these entrance points the bay recedes 4 miles to the eastward with a very even shoreline. The bay is steep-to and the depths are considerable, being apparently several hundred fathoms in the middle of the line between the entrance points, while the 100-fathom curve is everywhere from ½ to 1¼ miles from the shore. A steep-to, fringing coral reef, about 500 yards wide, the greater part of which dries at low water, appears in disconnected sections along the northern shore of the bay. It is narrower elsewhere. In Manado Road, which is an open roadstead in the inner portion of the bay off the town of Manado, the 100-fathom curve lies at a distance of 1,200 yards; the 10-fathom curve is from 100 to 600 yards from the shore, and within about 100 yards of the outer edge of a sand and coral flat, extending 100 to 500 yards from shore. Off Tokabene Point, 800 yards southward of the lighthouse, a shoal spit projects to a distance of 700 yards. In Manado Road and probably elsewhere in the bay, the bottom is of sand, or sand and stones.

As the bay is open to the westward, heavy seas are encountered during the northwest monsoon season, from November to February or March, but otherwise the water is calm. The Manado River is reported to cause a current setting out of the bay. This current is reported to be especially strong after heavy rains.

(2) Coastal topography. (FIGURE IV - 280)

Manado Bay is bordered by a coastal plain less than ½ mile wide. From this plain inland the ground rises gradually through benches and rolling hills to the interior mountains (PLAN 62). A broad valley extends to the southeastward, however, forming a corridor to the port of Kema. The ground is predominantly well-drained, and consists of sandy and gravelly soil. The coastal vegetation is of coconut palms and other cultivated groves, and is denser along the northern shore than elsewhere. A hard beach

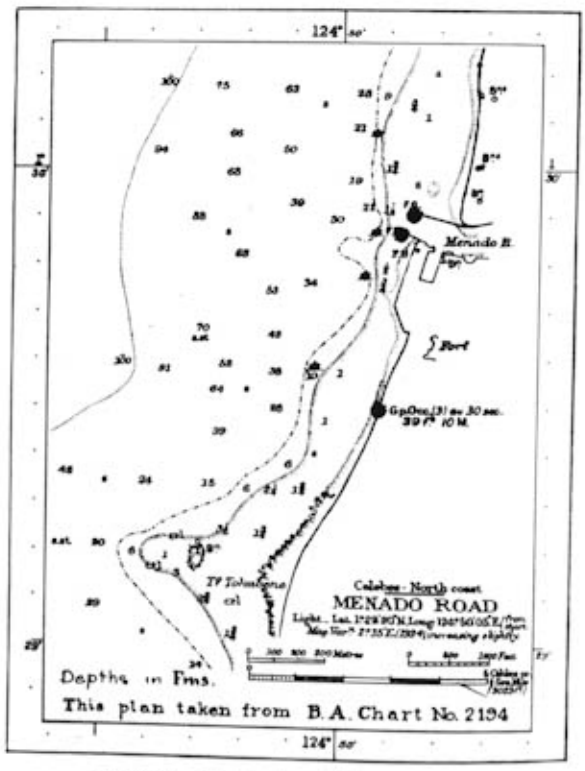


FIGURE IV - 280. *Northern Celebes, Manado Bay.*
Manado Road. Section from BA chart 2194. Soundings in fathoms.

of fine dark sand extends all along the bay. The beach varies in width from 10 to 50 yards. Mount Toempak (2,142 feet) lies at the north end of the bay and terminates in Pisok Point which is low and mangrove-covered. Mount Kalabat (6,634 feet) and Mount Lokon (5,197 feet) can both be seen from the roadstead.

The town of Manado is situated at about the middle of the eastern side of Manado Bay. The town extends in 2 long tree-planted avenues, parallel with the shore, and its outward appearance is that of a large park. The houses, which are built chiefly of wood and have grass-thatched roofs, are surrounded by gardens. All along the shore, coconut palms grow thickly, with huts scattered here and there among them. The Manado River, which rises in Tondano Lake, discharges at the north end of the town, and is very shallow; it is crossed by a bridge which is more than 300 feet long. About 500 yards south of the bridge there is a small steep hill, with roads winding up to the hospital on the top. There is a stone breakwater and a jetty at the river entrance.

(3) Anchorages. (See Chapter VI.)

(4) Dangers to navigation.

There are no off-lying shoals or other dangers, and depths are very great except close to the shore. Sario Reef, extending about 700 yards offshore, lies ½ mile southward of Manado Light, and was marked by a beacon. About ½ to ¾ mile south of the harbor there are 2 large submerged stones, but their exact location is not known.

(5) Landing beaches at Manado. (PLAN 55, Section B (f)) Reliability FAIR.

Beach borders the shore of Manado Bay north and south of the town of Manado (PLAN 62 and FIGURE IV - 281) (1° 30′ 00″ N, 124° 50′ 20″ E). South of the town, beach is known to be present for a distance of about 2 miles; it may extend 1 mile or more farther. It is probable that the beach has similar extent north of Manado. The approximate center of the beach is marked by the mouth of the Manado River and the sea wall, which extends southward from the river mouth for about 1,000 feet. The shore is everywhere steep-to at a distance of 300 to 600 feet from the beach, where there is a steep slope from 30 feet or more to 10 feet or less. The slope is gentle from the 10-foot depth to the beach. The approach is clear except for a reef patch about 1,000 to 1,500 feet offshore 1 mile south of the Manado River mouth. From October to April westerly winds cause heavy seas and surf, particularly in the months of December, January, and February. From May to September the beach area is completely protected. Maximum tidal range is about 7 to 8 feet at springs, minimum range, 2 feet, occurs 2 or 3 days after the quarters.

The beach consists of black volcanic sand, mixed in places with pebbles of dark volcanic rock; it is firm enough for motorized equipment. The beach slope is gentle; the width varies from 30 feet to about 100 feet, and an additional 100 to 200 feet of drying tidal flat are passable at low water. It is common practice for coolies to wade out to lighters which bring goods from ships anchored farther offshore. The beach as marked is free of coral reef except inshore of the reef patch described above. The north and south shores of the bay, where beach may be present, have a narrow fringe of coral reef. The beach is continuous except at the mouth of the Manado River, which is too deep to wade. A jetty on each side of the river mouth is a further obstacle to movement. For about 1,000 feet south of the river mouth the shore is protected by a sea wall. River and well water is used for the drinking water supply of Manado. The beach is backed by lowland, which is in large part either built up or cultivated. In most places the vegetation cover is open enough to permit easy movement of troops, and beach exits to the road which parallels the beach are numerous. From Manado there are road connections with all parts of northeasternmost Celebes, and telephone, cable, and wireless facilities are to be found in the town.

FIGURE IV - 281. *Northern Celebes, Manado Bay.*
Beach of black volcanic sand at head of Manado Bay. Looking N toward Manado River mouth. Southern end of sea wall at right center. Prior to 1937.

E. Tanahwangko Bay.
(PLAN 55)

(1) Offshore.

Tanahwangko Bay is about 5 miles wide between Mokoepa Point and Kelapa Point and penetrates the coast about 1½ miles. The water in Tanahwangko Bay is deep everywhere. The 100-fathom curve lies at a distance of about ¾ of a mile offshore. Deep water extends nearly to the steep-to fringing reef which is located in disconnected sections along parts of the shore. To the westward of Kelapa Point the 100-fathom line is about 3 miles offshore, but it is so close to the extensive fringing reef as to make it dangerous to approach this coast.

(2) Coastal topography.

The coast line from Manado Bay to Amoerang Gulf, which includes Tanahwangko Bay, is hilly with a sharp summit, 2,303 feet high southward of Kelapa Point. The hinterland is mountainous. Mount Lokon is the nearest of several prominent volcanic peaks, it is 5,197 feet high. Between Manado Bay and Kelapa Point there is only a narrow coastal reef approximately 300 yards wide except off Mokoepa Point, where it projects about ½ a mile offshore. On Tanahwangko Bay there are the villages of Mokoepa, Tanahwangko, and Popo. Several rivers enter the sea along this coast, the largest being the Ranowangko, Paniki, and Manoelawe Rivers. There is a hard-surfaced coastal road which parallels the shore about ½ mile from the coast between Manado and Tanahwangko. This road is connected with other roads leading to inland towns and to the other side of the island.

(3) Anchorages.

It would be difficult to obtain anchorage for large vessels in Tanahwangko Bay because the water in the bay is deep. Also the bay is exposed to the force of northwest winds during which time heavy seas prevail. It would be most advisable to seek anchorage in Manado Bay or Amoerang Bay during the months of November through February or March.

(4) Dangers to navigation.

The approach to Tanahwangko Bay is clear.

(5) Landing beach at Tanahwangko. (PLAN 55; Section B(g)) Reliability FAIR.

A beach about 3 miles or more in length borders the shore near the town of Tanahwangko (1° 23′ 50″ N, 124° 40′ 40″ E). A general marker for the beach is the volcanic peak Lokon, highest in the area, 8 miles east-southeast. The beach limits are known only approximately, and they may extend beyond the boundaries given. The shore is everywhere steep-to; depths of more than 30 feet lie a few hundred feet offshore. The approach is clear and the beach is exposed to strong winds and heavy surf in December, January and February. From May until September the beach area is well protected. Tidal range is about 7 feet maximum, 2 feet at neaps. The beach (FIGURE IV - 282) consists of black volcanic sand mixed with pebbles, cobbles, and blocks of volcanic rock. In general, sand predominates in bights and coves, and coarser material is more common near headlands or steeper parts of the coast. The beach is 10 to 50 feet wide and is continuous except where several small streams cross it. The mouths of these streams can be waded, though the beach may be soft near them; elsewhere the beach is firm enough for motorized equipment. At the village, where natives land, there is no reef; to the east and west a very narrow fringing reef borders the beach. Behind the beach there is a steep slope to rolling country 100 to 200 feet high. A hard-surfaced road parallels the beach at a distance of approximately

FIGURE IV - 282. *Northern Celebes, Tanahwangko Bay.*
Beach, looking W from village. 1939.

½ mile; this road is the principal route between Manado and Amoerang.

F. Amoerang Bay.
(PLAN 54)

(1) Offshore zone.

Amoerang Bay (FIGURE IV - 283) is 8 miles wide along the line between the entrance points of Tatapaan Point on the northeast and Walintau Point on the southwest. From this line the bay recedes about 8 miles to the southeast. The bay is deep, being about 500 fathoms in the middle of the line between the entrance points, while the 100-fathom curve lies everywhere only ¼ to 1 mile from the shore. In the southeast corner of the bay is Amoerang Road, which is 3 miles wide between its entrance points and recedes 1½ miles to the southward. In Amoerang Road the 100-fathom curve lies from 500 to 1,000 yards from the shore and the 10-fathom curve is from 30 to 300 yards from shore, the depths between these 2 curves decreasing gradually (FIGURE IV - 284). In the roadstead the bottom is of sand and mud. Elsewhere in the bay the bottom consists of sand, mud, shells, and gravel. A fringing coral reef extends for a distance of about 2 miles along the eastern shore of the bay, but is apparently absent, or extremely narrow, elsewhere. There is practically no surf in this area, and the water of the port is deep and calm. In the bay itself and near the entrance, currents have never been noticed.

(2) Coastal topography.

Amoerang Bay is bordered by a coastal plain ½ mile wide or less, backed by low benches abutting on rugged mountains. The ground is of gravel and sand along the shore and on the low benches. There are swamps along part of the north and south sides of Amoerang Bay. The vegetation is chiefly of coconut groves, with mangrove forests in the marshes.

The terrain in the vicinity of the bay consists of wooded and cultivated hills to the north and south, with elevated mountains in the background. The highest of these is Mount Soepoetan (5,981 feet), located about 12 miles southeast of the village

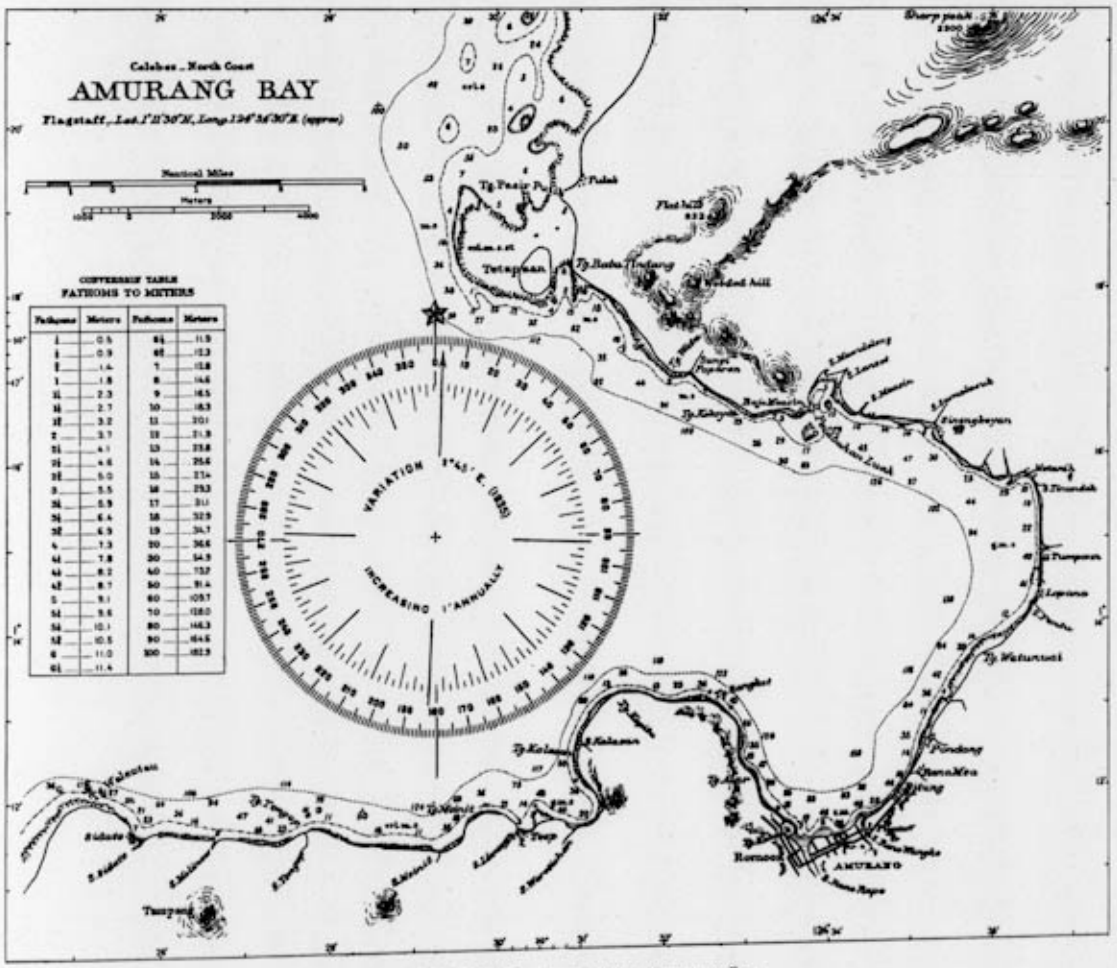


FIGURE IV - 283. *Northern Celebes, Amoerang Bay.*
Section from USHO chart 3062. Soundings in fathoms.

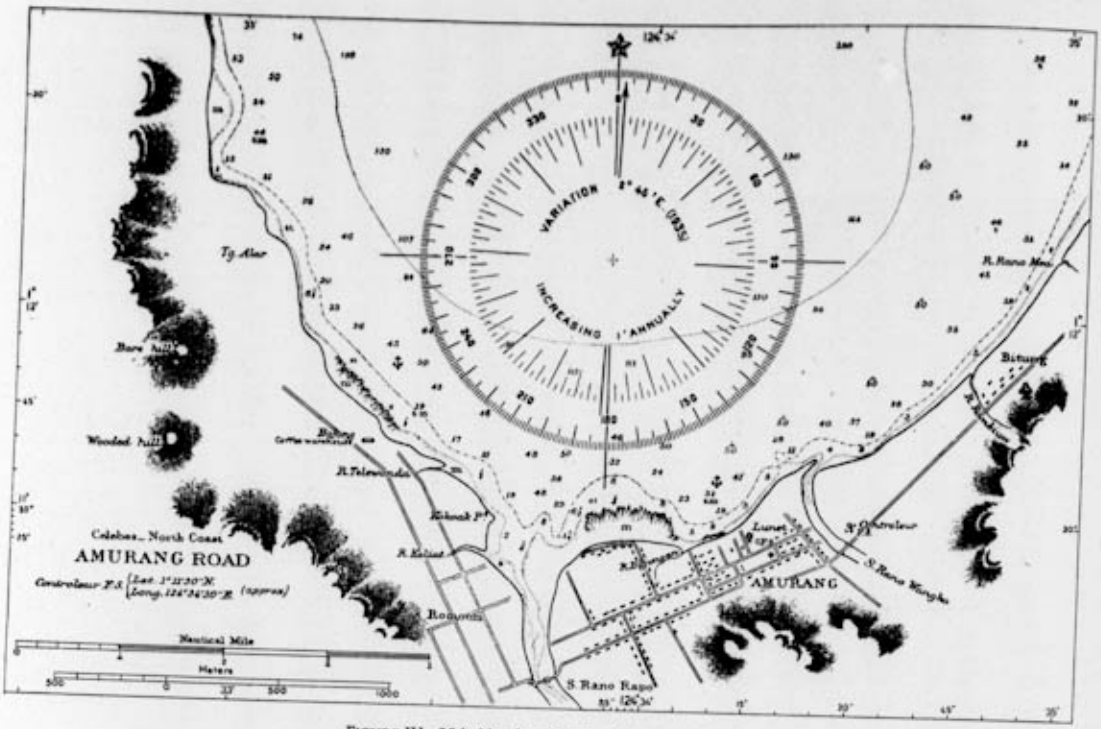


FIGURE IV - 284. *Northern Celebes, Amoerang Bay.*
Section from USHO chart 3062. Soundings in fathoms.

of Amoerang. Tatapaan is a low, thickly wooded island, which lies, with 4 rocks, on the drying reef projecting from Batoe Tindoeng Point. Between Tatapaan and the coast there is a small inlet on the reef. Four miles to the eastward, on the northern shore of the bay, is another inlet, Pelaboehan Loeak. A short, broad, hilly tongue of land projects from the south shore of the bay, forming an inner bay. Amoerang Road is in the southwestern part of this inner bay. Numerous streams and rivers, the largest of which is the Ranorapo, empty into the bay.

The town of Amoerang lies on the right bank and at the mouth of the Ranorapo. The town is regularly laid out with white wooden houses, and well-kept roads and paths. Near the shore are the remains of an old fort with a flagstaff. The mouth of the Ranorapo River is adjacent to the southwestern edge of the town. A bridge connects Amoerang with the neighboring village of Roemoën on the left or west bank of the Ranorapo. Back of the town the land is practically covered with coconut palms, which continue along the coast to Walintau Point.

(3) Anchorages.

Anchorages in this vicinity are discussed in Chapter VI.

(4) Dangers to navigation.

Except for a few scattered shoals very near the shore, there are apparently no charted dangers in Amoerang Bay.

(5) Landing beaches at Amoerang. (PLAN 54, Section B(h)) Reliability GOOD.

A beach 10 miles long borders the shore of Amoerang Bay between 1° 16′ 35″ N, 124° 33′ 30″ E, and 1° 11′ 20″ N, 124° 33′ 50″ E. (FIGURES IV - 285 and IV - 286). It was used by the Japanese forces in 1942. The beach extends northeastward from the town of Amoerang for about 5 miles, then north for 1 mile, and west-northwest for 4 miles. The shore is everywhere steep-to; depths of 30 feet are 600 feet or less offshore. The approach is completely clear except for a drying reef patch at the northwest end of the beach, just off the village of Badjo. During the southeast monsoon, from May to September, the bay is completely protected. From October to April good protection can be had from northwesterly or westerly winds by choosing a sheltered part of the bay shore; exposed parts will have heavy surf. Tidal range is about 7 feet at springs, 2 feet at neaps. The beach is 30 to 50 feet wide and has a moderate to steep slope; it is predominantly black volcanic sand with some coral sand, and is firm enough for motorized equipment. The drying tidal flat has negligible width. The beach is crossed by numerous small streams which can probably be waded; movement of motorized equipment across some of the stream mouths may be difficult or impossible. At Amoerang (FIGURE IV - 287), the beach is very narrow or lacking, but the shore is low and can be landed on directly. To the northeast, except for small streams, the beach is continuous for about 6 miles, more than 2 miles of which are fringed by reef. On the north shore of the bay the beach may be interrupted by stretches in which dense vegetation approaches the shore. Here the shore is low and can be landed on at any point. Villages and native landing places are found all along the beach. The beach is backed by lowland or by gently rolling low hills (FIGURE IV - 288). For 6 miles north of Amoerang it is paralleled by a 2-lane hard-surfaced road, which

FIGURE IV - 285. *Northern Celebes, Amoerang Bay.*
Steep beach of black volcanic sand. Looking N from N of Amoerang.

FIGURE IV - 286. *Northern Celebes, Amoerang Bay.*
Beach NE of Amoerang. Steep offshore slope permits boats drawing several feet to approach within 25 or 50 feet of beach. Looking N.

FIGURE IV - 287. *Northern Celebes, Amoerang Bay.*
Waterfront at Amoerang. Greater part of village is hidden behind trees. Looking SE. 1926.

FIGURE IV - 288. *Northern Celebes, Amoerang Bay.*
Part of beach. Date and direction of view unknown.

is nowhere more than ½ mile from the beach. Beach exits are numerous. On the north coast, a secondary road leads inland from the village of Badjo and connects with the main road about 4 miles from the beach. The nearest telephone, telegraph, wireless and other facilities are to be found at Manado, 25 miles to the northeast by hard-surfaced road. Just beyond the beach limit at Amoerang this road crosses the Ranorapo River by bridge and continues for some 25 miles to the west.

G. Koeandang Bay.

(PLANS 57, 58, and 59)

(1) Offshore zone.

Koeandang Bay is about 20 miles wide along the line between the entrance points, Besar Point on the east and Dondo Point on the west, and from this line it recedes nearly 10 miles to the southward. Depths in the bay are moderate, being from 30 to 40 fathoms along the line between the entrance points and shoaling everywhere gradually towards the shore. Except where it curves seaward 2 to 3½ miles to include the islands of Otangala and Pajoenga, with their surrounding reefs, the 10-fathom curve lies about 150 to 1,600 yards from the shore. The shore is indented with numerous small bays and inlets and is bordered by a comparatively narrow mud and coral flat. In the southeast part of the bay is Koeandang Road, which occupies a space about 2 miles square and lies to the eastward of Pajoenga Island and northward of the landing of Koeandang village. Within the roadstead the depths decrease from about 17 fathoms at its outer limit to 5 fathoms at about ½ mile from the landing place, and the bottom is of mud, while elsewhere in the bay it is of mud, sand, and coral. Koeandang Bay is fairly dotted with small islets, reefs, and shoals (FIGURE IV - 289). The reefs can usually be recognized by discoloration and 3 of them were marked by beacons. There are also small bordering coastal reefs, on some of which stand small islands. At various points along the shore small reefs extend into the bay. There are several off-lying islands. The smaller islands, such as Motoeo, are high; the larger ones, such as Otangala and Pajoenga, lying near the shore, are lower. Between these islands and outside them, along the outer edge of the submarine shelf, lie various scattered hidden rocks in shallow water. The same formations are found along the coast to the westward as far as Soemalata Point. No current has ever been noticed in Koeandang Bay.

(2) Coastal topography.

The irregular coast of Koeandang Bay consists of a series of hilly capes separating small plains less than a mile wide, backed by benches and rolling hills. The highest elevations in the vicinity of the bay are approximately 6,000 feet and 8,000 feet, being

those of mountains situated about 16 miles west and 8 miles southeast, respectively, of Koeandang village. Pajoenga Island, which lies northwest, and Groene Heuvel (Green Hill), situated about 2½ miles northeast of Koeandang village, are conspicuous landmarks. Hilly islands dominate the bay, Motoeo Island, near the western entrance point, has a densely wooded summit, 860 feet high, and is visible from a long distance. Much of the soil near Koeandang Bay is sandy or gravelly. The vegetation consists of mangroves and nipa on the lowland shores, with coconut groves on the plains. The intervening hills are densely wooded.

Koeandang village (called Moloo) is located 2 miles inland from Koeandang Road; it is hidden in a forest of mangroves and nipa palms and is not visible from the harbor. Near the village there are the ruins of a stone fort, and on the nearby coast there is a pier.

(3) Anchorages. (See Chapter VI.)

(4) Dangers to navigation.

Koeandang Bay is full of islets and reefs but the latter can generally be recognized by discolored water, and 3 of them were marked by beacons.

Haarlemmermeer, an extensive reef with a least depth of 1¾ fathoms, lies near the 100-fathom curve, about 5 miles northwest of Hoelawa Island, and is the northernmost danger off Koeandang Bay.

Merapi, with 3½ fathoms of water, lies 3¾ miles east-northeastward of Hoeha Island.

A large reef in the shape of a horseshoe, with a least depth of 1¾ fathoms, extends from the north side of Hoelawa Island and curves to westward.

In the passage southward of Papaja Island and Motoeo Island at the western entrance to Koeandang Bay, there are 2 reefs with a depth of less than 6 feet of water.

Laimoela Reef, with 3½ fathoms of water, lies 2½ miles northward of Motoeo Island.

(5) Landing beaches.

(a) Samija Bay beach. (PLANS 57, 58, and 59, Section C(a)) Reliability POOR. At the north side of the entrance to Samija Bay is a short stretch of beach lying at about 0° 56′ 40″ N, 122° 57′ 28″ E. The beach is 1,500 feet long, and is composed chiefly of coral sand. The coral reef fronting it is 800 feet wide at the west end of the beach, but narrows to 300 feet at the east end. The 30-foot depth line lies 1,000 feet off the west end of the beach, 500 feet off the east end. The nearest trail can be picked up 1½ miles east of this beach at the head of Samija Bay. It leads southwestward 7 miles to Koeandang, from which a first-class road leads southward.

(b) Koeandang beach. (PLANS 57, 58, and 59, Section C(b)) Reliability POOR. The beach near Koeandang extends from 0° 52′ 20″ N, 122° 55′ 40″ E to 0° 51′ 30″ N, 122° 54′ 12″ E. It is more than 2 miles long, but interrupted ½ mile from its northeast end by a 1,000 foot stretch of cliff. The beach is composed of coral sand and mud, and is not recommended in wet weather. The coral reef fronting the beach varies from 400 to 1,200 feet in width; the widest part of it extends to and around a small islet located 1,000 feet from the shore and ½ mile from the western end of the area. The surface of the reef is muddy. The bottom slope seaward from the reef is very gradual; the 30-foot line lies from 2,000 feet offshore at the east end of the area to 1¼ miles off the beach at the west end. At the center of the beach is a cable house from which a cable extends to Makassar and to Manado. The village of Koeandang lies a short distance inland from the beach; from it a first class road leads southward across the peninsula to Gorontalo on the Tomini Gulf coast. Coastal trails lead east and west from Koeandang village.

(c) Landing places on Pajoenga Island. (PLANS 57, 58, and 59, Section C(c)) Reliability POOR. No actual beaches are known on Pajoenga Island but 3 small villages located on the island mark native landing places. One landing place, on the southeast shore, is located at 0° 51′ 50″ N, 122° 54′ 05″ E; one on the northeast shore at 0° 53′ 35″ N, 122° 53′ 40″ E, and one on the south shore of the northwestern end of Pajoenga Island at 0° 53′ 55″ N, 122° 52′ 50″ E. The 2 landing places at the north end of the island are fronted by extensive drying reef areas, and the 30-foot depth line lies 1,200 to 1,500 feet offshore. The beach at the southeastern end of the island is fronted with reef about 200 feet wide, and by relatively shallow water between it and the Koeandang beach across from it.

(d) Otangala Island beaches. (PLANS 57, 58, and 59, Section C(d)) Reliability POOR. A beach area is located on Otangala Island between 0° 53′ 55″ N, 122° 48′ 40″ E and 0° 54′ 20″ N, 122° 48′ 05″ E. The beach consists of 2 sections. A western section is 1,200 feet long. An eastern section is ½ mile long. The 2 beaches are separated by ¼ mile of low shore, heavily wooded and probably mangrove-bordered. The beaches are composed chiefly of coral sand and debris. The coral reef fronting the western section is 400 feet wide, and the 30-foot depth line lies 700 feet from the shore. Off the eastern section of beach the reef width varies from 1,000 to 1,200 feet and the

FIGURE IV - 289. *Northern Celebes, Koendang Bay.*
Entrance to Koendang Harbor. Date and direction of view unknown.

30-foot depth line lies 200 to 300 feet seaward of the reef edge. No habitations are known near these beaches.

(e) *Beaches on west coast of Koeandang Bay.* (PLANS 58 and 59, Section C(e)) Reliability POOR. The terrain along the west shore of Koeandang Bay is somewhat more elevated than in other parts of the bay. Here, along an 8 mile stretch of shore eastward from the west entrance to the bay, is a series of 8 beaches with a total length of 3¾ miles, between 0° 53′ 40″ N, 122° 42′ 30″ E and 0° 57′ 50″ N, 122° 37′ 40″ E. The shoreline is continuously bordered by coral reef, which varies in width usually between 500 and 1,000 feet, although in some places it is wider, in others narrower. In general the 30-foot depth line lies 200 to 400 feet seaward of the reef edge. The beaches are formed of coral and quartz sand and pebbles, and have steep to moderate slopes. The character of the landing place at the eastern end of this area is not known, but a small village is located on the shore here, which is evidently used for landings by the natives. A trail near the shore leads eastward to Koeandang 24 miles distant, where junction is made with a first-class road running southward.

H. Tolitoli Bay.

(PLANS 58 and 60)

(1) Offshore zone.

Tolitoli Bay has an entrance width of 1.3 miles between Laboehan Dedeh Point on the north and Tolitoli Point on the south, and recedes 1¼ miles to the southeastward (FIGURE IV - 290). Both entrance points are bordered by a narrow, fringing reef of coral, which extends along the coast of the bay for a distance of about 1,200 yards beyond Laboean Dedeh Point and 600 yards beyond Tolitoli Point. The remaining shore of the bay, about 2¼ miles in length, is bordered by a flat of mud and sand with an average width of 400 yards. The bottom of the bay is of mud and the depths decrease from about 19 fathoms on the line between the entrance points to 10 fathoms within about 600 yards from the shore, deep water lying somewhat closer to the northern than to the southern shore of the bay. There are no charted dangers, other than the fringing coastal reef, within the bay itself, and the nearest obstruction is Latoengan Island which is situated 1 mile northwest of Tolitoli Point and stands on a coral reef 1 mile long and ½ mile wide.

The coast between Boelias Bay and Tolitoli Point, about 3½ miles to the northeast, is fringed by a fairly broad coastal reef, with some small detached reefs outside. The entire coast from Boelias Bay to Kekoh Point is fronted by a submarine shelf which extends to a distance of 5 to 14 miles offshore and falls off steeply at its outer edge to great depths. There are several small islands and detached reefs on this shelf and the bottom is of coral, or coral and shells, with an average depth of 30 to 40 fathoms. Boelias Bay is a narrow passage between Tingi Langa Island and the coast. Several reefs lie off the entrance, which is on the east side of Tingi Langa. The depths decrease from 20 to 25 fathoms at the entrance to 15 fathoms in the basin south of the island.

There is a clear deep channel, 2 miles wide, between the eastern end of Kapetan Island and Tingi Langa Island. The channel between Toempangan Island and Bool Islet is unsafe, owing to the presence of a detached reef, with a depth of 1¼ fathoms over it, lying about 800 yards north of Bool Islet. The channels north and south of Latoengan Island are clear, but with bad visibility the north channel is preferable.

There seems to be no current of any importance in Tolitoli Bay itself.

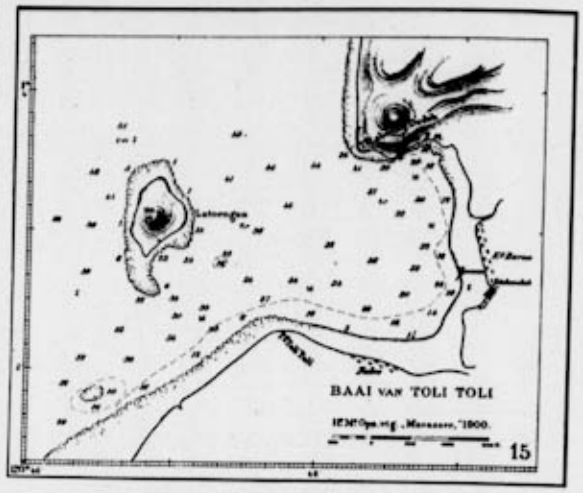


FIGURE IV - 290. *Northern Celebes, Tolitoli Bay.* Section from NHO chart 175. Soundings in meters.

(2) Coastal topography.

The coast immediately north and south of Tolitoli Bay is backed by a plain. There is a semicircle of hills around the bay itself, and a range of high mountains about 8 miles inland. The soil on the plain is chiefly sandy or gravelly. The vegetation consists of coconut and sago palms and fairly open woods. The mountains are forested.

The coast between Boelias Bay and Tolitoli Point, about 3½ miles to the northeast, is mountainous and densely wooded and is fringed by a partly drying coastal reef. Tolitoli Point is low and clothed with mangroves, the mountains here making a wide circle inland.

The shore of Tolitoli Bay is mostly fringed by a sandy beach. The village of Naloe lies in the middle of the south shore and the village of Kampoengbaroe, or Tolitoli, is located at the head of the bay. At the latter village a large house with a "zinc" roof is a very striking object (FIGURE IV - 291), and in front of it a stone pier extends westward from the shore. There are no roads in this vicinity. Several streams flow into the bay.

Laboean Dedeh Point, at the northern limit of the bay, is a steep rocky point where the mountains recede from the coast, leaving a large cultivated plain around the bay.

Kekoh Point is rocky and lies 3½ miles northward of Laboean Dedeh Point. On Kekoh Point is a hill, 561 feet high, with a remarkable round tree on the summit, visible from the westward as far as Simatang Island.

Tingi Langa Island is thickly wooded and about 2 miles long. It lies 600 yards from the coast, 4 miles southwest of Tolitoli Point. In the northeastern part it attains a height of 709 feet and is very conspicuous. The southwestern point is joined to the main coast by the surrounding reef, but on the southeastern side is a narrow bay, named Boelias, which extends inland in 3 arms, with shores lined by a coral reef. The village of Boelias is situated on the eastern side of the entrance.

Kapetan Island is long, narrow, and unequally wooded. It is separated from Tingi Langa Island by a channel nearly 2

FIGURE IV - 291. *Northern Celebes, Tolitoli Bay.*
Landing place at Baroe. Looking E. 1939.

miles wide. A ridge of hills runs almost the entire length of the island, a small flat part in the middle only giving it the appearance of 2 islands. The most conspicuous summit, 571 feet high, is in the southern part. From the northeastern point the coast reef, which encircles the island, extends fully 1 mile, with Bool Islet lying ½ mile from the point.

Toempangan Island and the smaller Boloh Islet to the westward lie together on a large drying reef, about 1 mile north of Bool Islet.

Latoengan Island, 522 feet high and thickly wooded, lies across the entrance to Tolitoli Bay. It is surrounded by a fringing coral reef which extends about 600 yards from its south point and 200 to 400 yards from its north point.

(3) Anchorages. (See Chapter VI.)

(4) Dangers to navigation.

Kapetan Island. A rock above water, with depths of 10 fathoms around it, lies about 200 yards outside the coastal reef, extending from the northwestern end of Kapetan Island.

Bool Islet. A detached reef, with a depth of 1¼ fathoms over it, lies about 800 yards north of Bool Islet.

Pamanoekan Islet, a conspicuous rock with a white top and a few bushes on it, lies on a detached reef, 1,400 yards northeastward of Toempangan Island, and is visible about 7 miles in clear weather. About 1,400 yards 34° from this rock is a small coral reef with a depth of 2 fathoms over it.

Tolitoli Point. A detached reef, partly drying, lies 1⅓ miles 254° from Tolitoli Point. Another reef, with a depth of 3 feet, lies about ¾ mile 324° from the same point.

Lolah Reef, which dries partly, lies 2 miles to the northward of Pamanoekan, and can generally be recognized by discoloration.

Boeloe Mata Reef, with a depth of 7 fathoms, lies near the edge of the 100-fathom curve, 4½ miles to the northward of the highest part of Kapetan Island.

Batang Reef, with 3½ fathoms of water over it, lies 5½ miles 316° from Kekoh Point and is not easily seen.

Dalanang Reef, dries at half tide. It lies 8 miles, 302° from Kekoh Point.

Boelias Bay. On the west side of the entrance to the bay is a small reef awash. A similar reef lies nearly 1 mile to the northeastward, close to the coast.

Tingi Langa Island. About 1,400 yards northward of the east point of Tingi Langa Island is the eastern extremity of a large coral reef, consisting of 2 parts, awash at low water, with 10 fathoms between.

(5) Landing beaches.

(a) Balowoh beach. (PLANS 58 and 60, Section D(a)) Reliability FAIR. The beach is located between 0° 57′ 12″ N, 120° 40′ 00″ E and 0° 57′ 14″ N, 120° 40′ 40″ E. The reef fronting the beach at Balowoh is about a mile wide, but a channel across it here affords passage to native vessels. The tidal range varies from 6 inches to 2¼ feet. The reef partially dries. The beach faces north, is about ¾ mile long, and probably 100 feet or more wide. It is composed of coral and quartz sand, and gravel. It has a gently sloping surface, and is generally firm. The wide reef, and Kapetan Island offshore, offer considerable protection from heavy seas from the north and northwest. The surf is never heavy on the shore, and is rarely heavy even at the outer edge of the reef. The beach borders a broad coastal plain. Near the eastern end of the beach, where a stream reaches the sea, the plain is low and swampy. Vegetation is chiefly nipa and mangrove. There is a trail near the shore.

(b) Boelias beach. (PLANS 58 and 60, Section D(b)) Reliability FAIR. The center of the beach at Boelias is located at 0° 59′ 55″ N, 120° 45′ 00″ E. The beach borders a small cove on the east side of the entrance to Boelias Bay, which lies between Tingi Langa Island and the mainland. The cove is filled with coral reef which extends 500 feet beyond the entrance of the cove into the bay. The bay entrance is deep, however, and the bay itself is well protected from all winds. The tide range is between 6 inches and 2¼ feet. The beach in Boelias Bay is less than 1 mile long and very narrow. Directly fronting Boelias, it is composed of quartz and coral sand mixed with much gravel, and has a gentle to moderate slope. Southward the slope steepens and the beach is covered with coarse debris and boulders. Inland from the beach the terrain slopes steeply and is heavily forested. A trail follows the shore.

(c) *Kapetan Island beach.* (PLANS 58 and 60, Section D(c)) Reliability FAIR. The central part of Kapetan Island is low and bordered on the south side by a beach between 1° 03′ 30″ N, 120° 37′ 35″ E and 1° 02′ 33″ N, 120° 39′ 05″ E. The beach is 1½ miles long and relatively narrow for the most part. At each end the coral reef bordering it is ½ mile wide. At the center the reef narrows to perhaps a hundred feet and here, on the east side of a low point, is located a small village. The beach is composed chiefly of coral sand and debris, and has a gentle to moderate slope with a relatively smooth surface. The surf is rarely heavy and breaks on the reef some distance from the shore. The tidal range varies from 6 inches to 2¼ feet. The terrain inland from the beach rises to a few low hills. These are heavily forested.

(d) *Tolitoli beach.* (PLANS 58 and 60, Section D(d)) Reliability FAIR.

1. Location and extent. The beach bordering Tolitoli Bay extends south of the bay entrance to within a mile of Boelias. Its limits are 1° 00′ 40″ N, 120° 45′ 48″ E and 1° 03′ 40″ N, 120° 48′ 22″ E. Altogether the beach is about 7 miles long. It is interrupted by numerous stream mouths. A conspicuous "zinc"-roofed house locates Baroe village.

2. Nearshore. The southwestern section of the beach, to the headland of Tolitoli Point, is fronted by coral reef 1,000 feet to ½ mile wide. The 30-foot depth line lies very close off the edge of the reef. In Tolitoli Bay the beach is fronted by a sandy flat which dries 1,200 feet out from the high water line. However, 30-foot depths are found well inside the bay. The north shore of the bay is bordered by coral reef of width varying from ¼ mile to 100 feet or so. Depths of 30 feet are found very close to the outer edge of the reef. A north-going current is frequently found in and near the bay. The tidal range varies from 6 inches to 2¼ feet. Latoengan Island, off the mouth of the bay, offers some protection from heavy seas.

3. Character of beach. Southwest of Tolitoli Point the beach is composed chiefly of coral debris (FIGURE IV - 292), and has a rough and rocky surface with steep to moderate slope except near the numerous stream mouths where it is gentler and of more nearly even texture. In Tolitoli Bay the beach is wide, gently sloping, and composed of quartz sand, scattered pebbles, and rock debris. At the north end of the bay it is relatively steep and rough. Two piers extend from the beach; one fronting the village of Baroe at the middle of the east shore of the bay; and one extending from the middle of the north shore of the bay. These are of stone and wood, respectively; the one at Baroe being 295 yards long, the northern one 85 feet long.

4. Adjacent terrain and exits. From the southwestern part of the beach moderate to steep slopes are found rising to hills inland. Tolitoli Bay is bordered by a low, marshy area of mangrove and nipa swamp. Vegetation is heavy. A trail lies close to the shore south of Baroe, and from Baroe northward a second-class road borders the shore.

(e) *Kekoh beach.* (PLANS 58 and 60, Section D(e)) Reliability FAIR. The beach south of Kekoh Point lies between 1° 04′ 36″ N, 120° 48′ 24″ E and the mouth of the Kekoh River at 1° 06′ 49″ N, 120° 47′ 43″ E. The beach is 2½ miles long and of moderate width. The 30-foot depth line lies about ¼ mile offshore, and the sandy bottom slopes gently to the beach from this point. The sand flat dries from 600 to 800 feet at low tide. The tidal range varies from 6 inches to 2¼ feet. The north end of the beach is the best protected from winds and waves which come from the north and northwest in the heaviest weather. The beach is composed chiefly of sand and small pebbles, with little or no coral. It is gently sloping and of questionable firmness, especially near the north end where it may be quite soft. It is backed immediately by a marsh and lagoon area about ½ mile broad, which is in turn backed by a broad plain heavily wooded and sporadically cultivated. A secondary road parallel to the shore runs not far inland.

FIGURE IV - 292. *Northern Celebes, Tolitoli Bay.* Village and beach 3 miles south of landing pier at Tolitoli. Probably Naloe village. The beach is covered with loose scattered debris. Looking E.

(f) *Kekoh—Tendeh beaches.* (PLANS 58 and 60, Section D(f)) Reliability FAIR. Three stretches of beach interrupted by short cliffed areas extend between the headland of Kekoh Point and the low cape opposite Tendeh Island, from 1° 07′ 15″ N, 120° 47′ 20″ E, to 1° 10′ 16″ N, 120° 47′ 58″ E. The shore of this area is fronted by a sand flat, drying at low tide, about 100 feet wide at the southern end of the area and increasing in width northward to about 500 feet, and even wider at the extreme north end where it ties Tendeh Island to the mainland. A shoal area is located about 200 feet from the shore 1 mile north of Kekoh Point. The bottom shelves abruptly near the edge of the drying sand flat, so that the 30-foot line lies close off the edge of the flat. The 3 beaches are, from south to north, 1¾ miles long, ½ mile long, and ¼ mile long, respectively. They are separated by areas of low cliffs. The beaches are composed of quartz sand, gravel, and pebbles. The southernmost beach is of moderate width, possibly as much as 100 feet at its southern end. The terrain immediately behind the south end of this beach is low and marshy, with nipa and mangrove common, but along the remainder of the shore northward moderate slopes rise inland to low hills. The middle beach is the narrowest; beach slopes are gentle to moderate. The northernmost beach, near Tendeh Island, forms a low sand peninsula extending toward the island. A second-class road is located not far from the shore in this area.

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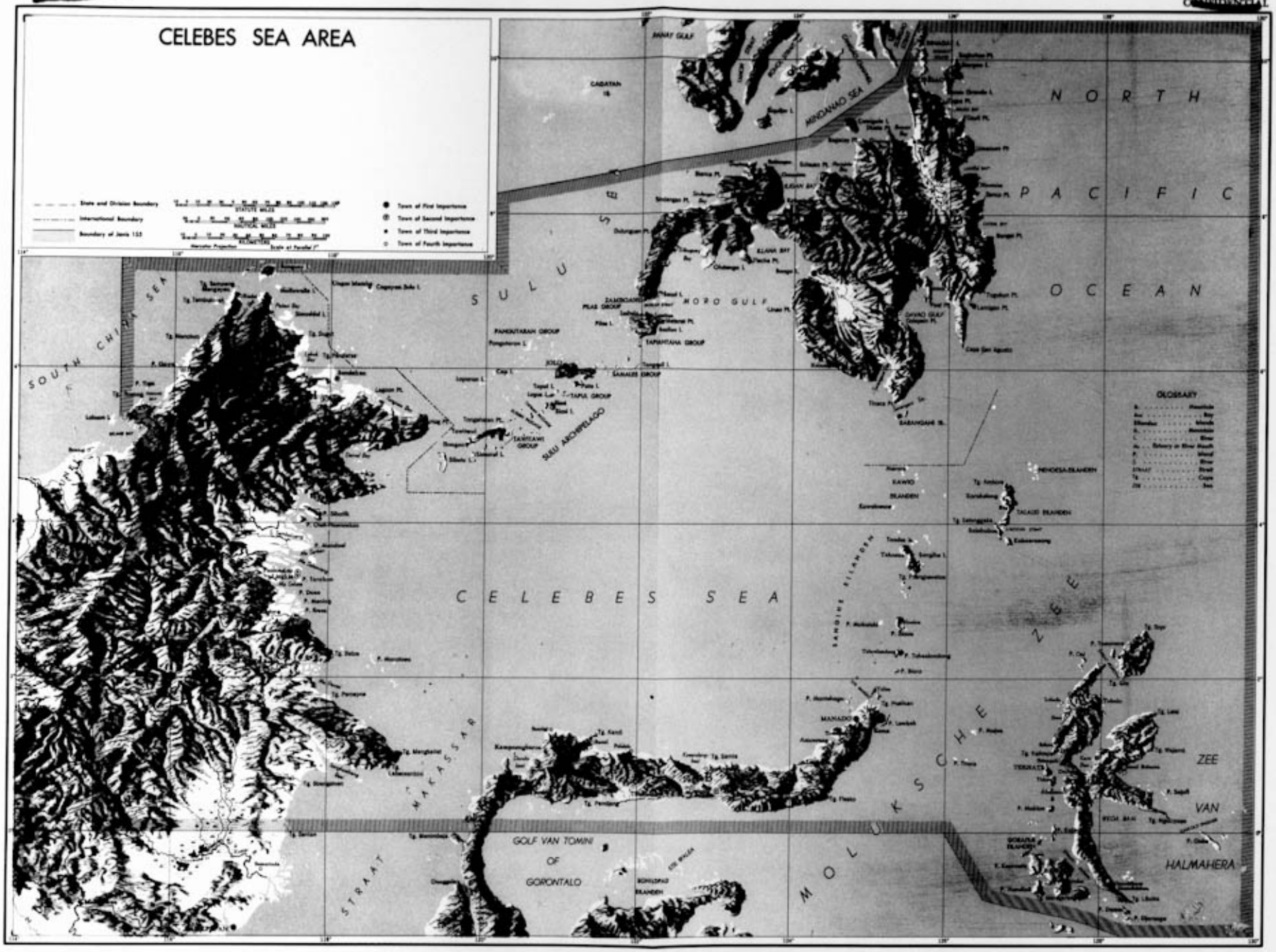
50. Netherlands, Ministerie van Marine. Afdeeling Hydrographie.
Charts. 1:100,000.
1:200,000. Various dates.


CELEBES SEA AREA
State and Division Boundary
International Boundary
Boundary of Jonis 155
STATUTE MILES
NAUTICAL MILES
KILOMETERS
Town of First Importance
Town of Second Importance
Town of Third Importance
Town of Fourth Importance
SULU SEA
SOUTH CHINA SEA
MINDANAO SEA
PHILIPPINE SEA
CELEBES SEA
MOLUCCA SEA
NORTH PACIFIC OCEAN
ZEE
MORO GULF
DAVAO GULF
ILIANA BAY
SIAU ARCHIPELAGO
SANGIHE ISLANDEN
TALAUD ISLANDEN
MINAHASA-ISLANDEN
SARANGANI IS.
MANADO
TERNATE
HALMAHERA
STRAAT MAKASSAR
GOLF VAN TOMINI OF GORONTALO
GLOSSARY